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*city county and state*

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THIS 21 YEAR OLD NYE
is still "a wonderful plant"

"We have a very wonderful plant in which we burn twenty tons of garbage per eight hour day. One man operates our NYE incinerator and the cost per ton is cheap*. No reconditioning has been required since it was built in 1928 and it is still in first class condition, much to your company's credit."

Chas. P. Clarke

CITY ENGINEER
GREENVILLE, PA.
MAY 4, 1949

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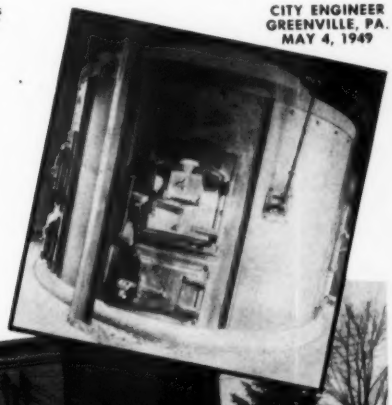
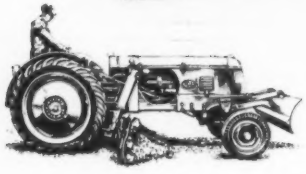


NYE ODORLESS INCINERATOR COMPANY INC.
America's Leading Builders of Municipal Incinerators Since 1905
EAST 42nd STREET • NEW YORK 17, N. Y. • MURRAY HILL 2-8413

# YOU'LL GET MORE DONE... with HUBER TANDEM ROLLERS with Fluid Coupling!



THE HUBER MAINTAINER
with bulldozer, patch roller, berm leveler, lift loader, mower, broom, or snow plow attachments.

HUBER 3-WHEEL ROLLERS
5 models—5 to 12 tons.

You'll do a better job for less money with Huber Tandem Rollers. The variable weight advantage takes care of more jobs for a smaller investment . . . with its speed and maneuverability it covers more jobs . . . and fluid coupling drive makes all working parts last longer. This coupling protects the mechanism in either forward or reverse. It allows the engine to deliver full torque regardless of the speed of the roller. For final compaction, the ability of fluid coupling to absorb continual reversing shock reduces "scuffing" of the road bed and assures a smoother job.

For the facts on fluid coupling or information on other Huber road machinery—3-wheel rollers, maintainers, and trench rollers—see your Huber representative or write for descriptive bulletins.

HUBER

THE HUBER MFG. COMPANY
Marion, Ohio, U.S.A.

HUBER 3 Wheel • Tandem ROAD ROLLERS and MAINTAINERS

# YOU NEED BOTH HALVES OF THE SCISSOR

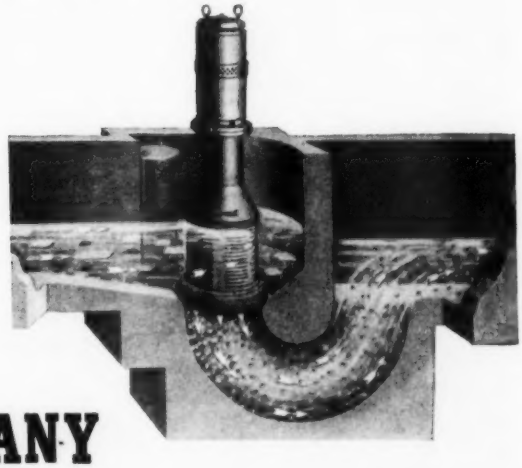
In the CHICAGO Comminutor the cutters and shear bars cut and chop; the channel feeds and holds.

The combination of channel and rotating drum makes the CHICAGO Comminutor the only effective method for cutting and screening sewage solids in the stream.

Engineering details of exclusive CHICAGO Channel Designs for any sewage flow are available to engineers on request.

Over 2000 successful installations prove "You Need Both Halves Of The Scissor."

The CHICAGO Comminutor is always placed in an exclusively designed feeder channel. The hydraulic characteristics are such that accumulating solids cannot clog the drum slots; nor can rope-like material jam the drum. Comminution is rapid and positive. Sub-surface screening is continuous and automatic.

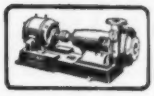


Cross section of a CHICAGO Comminutor channel illustrates a typical design of controlled discharge channel. Sheared small particles must pass through a maximum drum slot width of 3/8 in. Comminuted matter completely settles out in the primary tanks.

## CHICAGO PUMP COMPANY

### SEWAGE EQUIPMENT DIVISION

**2348 WOLFRAM STREET** — **CHICAGO 18, ILLINOIS**



Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers, Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

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JUNE, 1949

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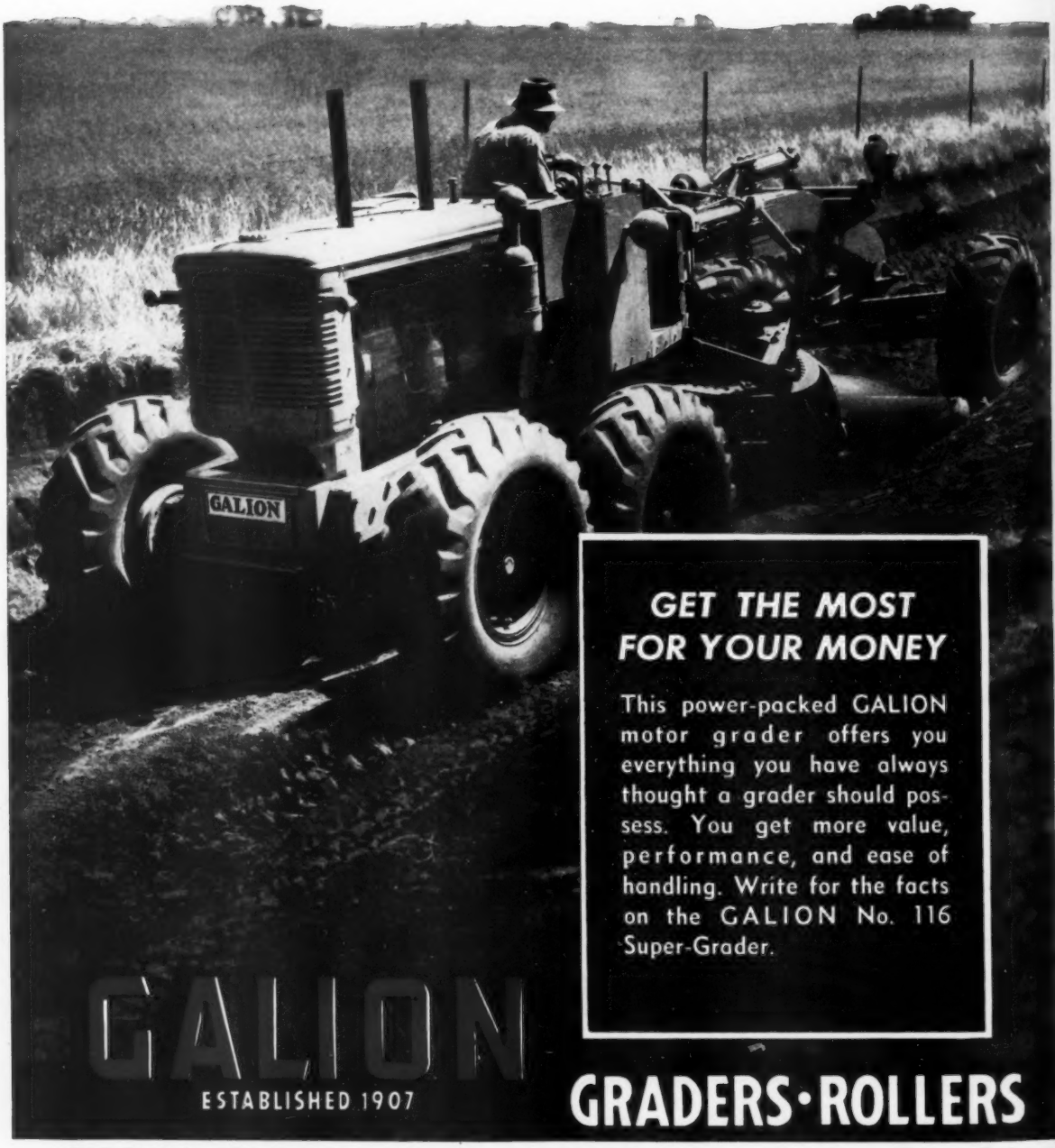


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This power-packed GALION motor grader offers you everything you have always thought a grader should possess. You get more value, performance, and ease of handling. Write for the facts on the GALION No. 116 Super-Grader.

GALION
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1949

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# PUBLIC WORKS

## THE ENGINEERING AUTHORITY IN THE CITY-COUNTY FIELD

*Edited by*

**W. A. HARDENBERGH and A. PRESCOTT FOLWELL**

**JUNE, 1949**

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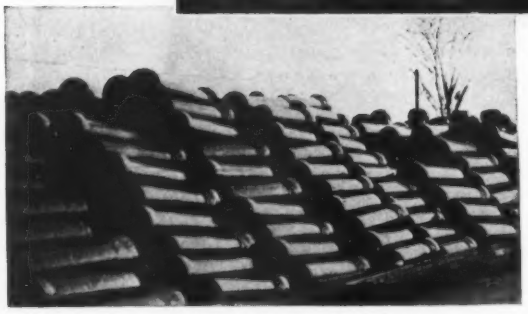
**Founded in 1896**

Colorful Baton Rouge is spending six million dollars to make its sewer system as modern as the city it serves. Vitrified Clay Pipe has been specified for this huge project. 250 miles of new sewers, using clay pipe up to 36", are going in. This includes 10,000 house connections, most of which are 4" and 6" Clay Pipe. Three contractors on this huge project are Sullivan, Long and Hagerty of Bessemer and Birmingham, Ala.; E. L. Dalton & Co. of Dallas, Texas; Forcum-James & Co. of Baton Rouge and Dyersburg, Tenn.



# BATON ROUGE USES CLAY PIPE FOR $6,000,000 SEWER PROJECT

## Clay Pipe is Vitrified to Last for Centuries

CLAY PIPE'S raw material, clay, is chemically-inert and acid-resistant by nature. When it is formed into pipe and vitrified at fusing temperatures, it becomes a strong, cohesive pipe that *can't* disintegrate . . . that delivers centuries of trouble-free service. Clay Pipe is the *only* pipe that lasts forever under *any* sewerage or drainage conditions.

*If you need specific information on a Clay Pipe question, write to the office nearest you.*

*Vitrified*
**CLAY PIPE**

**National Clay Pipe Manufacturers, Inc.**
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522 First National Bank Bldg., Atlanta 3, Ga.
703 Ninth and Hill Bldg., Los Angeles 15, Calif.
1105 Huntington Bank Bldg., Columbus 15, Ohio

CLAY PIPE NEVER WEARS OUT!

C-449-1

# *The* EDITOR'S PAGE

## Dull Shovels Cost Money

A hand shovel that is only slightly dull loses 7% of its effectiveness, according to the findings of job analysts. If the man who wields that dull shovel is paid $40 per week, the dull shovel costs $2.80 per week. With this sum, a new shovel could soon be bought, or the dull shovel could be sharpened several times.

If the shovel is of poor design or poor material, it is likely to become dull more quickly, or it may not have been efficient in the first place, so that the loss may be greater than 7%. The same factors apply to other tools, both hand and power. Because power tools do so much work as compared to hand methods, we are prone not to question their efficiency, but to accept what they are doing as satisfactory.

Probably no city, county, state or contractor could ever really afford to use inefficient tools, but in the good old days—if that is what they were—of low labor costs, often not much attention was paid to these factors. With costs what they are today, no one can afford to be complaisant about inefficient tools. This applies whether we are talking about the lowly pick and shovel, the wornout power roller, the tractor-bulldozer team, or the centrifugal pump that delivers the city water. Checking up now and then by an experienced realist can save money. This is another of the ways in which engineers can earn their pay many times over.

## For Better and Less Costly Mosquito Control

The season for mosquitoes is about here, though no doubt some of our southern readers will differ with us and ask where we have been for the past couple of months. DDT and oil will be spread on what would otherwise be prolific waters. In the past, a handicap to local mosquito control has been the high cost of treating small water areas. Airplane dusting or spraying is not suitable; to anyone who is cost-minded and takes the trouble to figure the cost of applying oil in terms of gallons applied—or on any other basis—the results will be shocking. Now come DDT pellets which can be tossed into these puddles and pools; they should reduce the cost; and they should be especially efficacious against *psorophora*, those fierce biters and prolific producers which are the bane and the nightmare of the mosquito control crew. Maybe mosquitoes are on the way out; here's hoping.

## Sensible Court Ruling on Patented Articles and Best Bids

A recent ruling of the Virginia Supreme Court of Appeals holds that there is nothing to prevent the use of patented articles "else public bodies might be prevented from availing themselves of new inventions and required to depend upon the cobblestones of their forefathers." As to the "lowest" and "best" bids, it is clearly within the rights of local authorities to ascertain "which bid best serves the interests" of the community. Needless to say, we are heartily in accord with these common-sense rulings. Our cities, counties, and states need, and are entitled to, the best engineering and the best materials, and any policy that is designed to make them buy merely on the basis of price is unsound.

## Bringing Young Men Into Public Service

Age groupings of employees were included in a recent State Highway Department report. Of the employees working on an hourly basis, 28% were over 60 years old and approximately 50% were over 50 years old. Of the supervisory personnel, 60% were over 60; of 91 foremen, the average age was 51½ years and 20% were over 60.

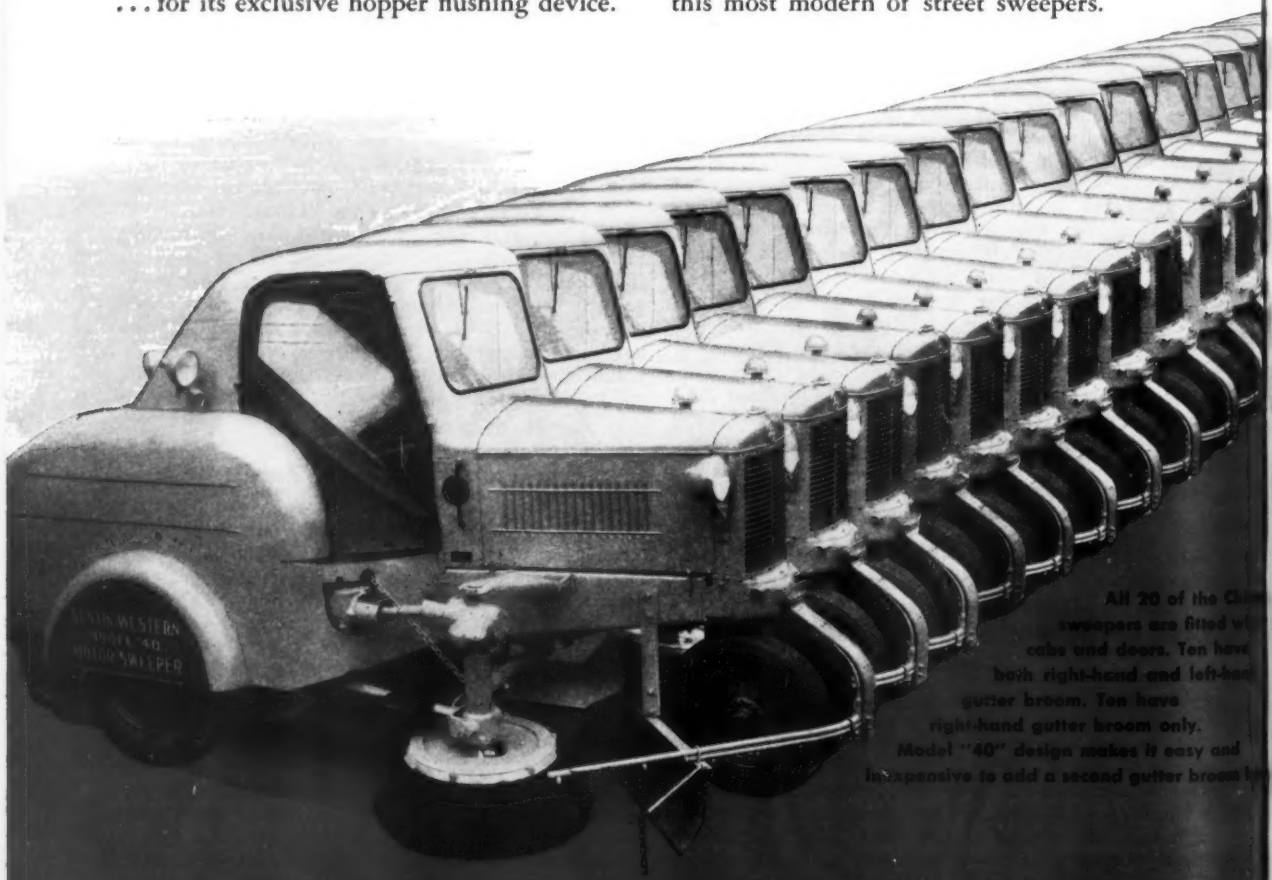
We have always believed that older employees are valuable men and should be retained just as long as possible; but we also believe that there should be a constant inflow of younger men. In the state mentioned, less than 10% of the hourly personnel was under 30 years of age; none of the supervisory group was under 50; and only 10% of the foremen were under 40.

Measures must be taken to attract capable younger men to public service, both in the hourly categories and in others. To the advantages of permanence, vacation and sick leave must be added the attraction of an adequate pay scale, not only for beginners, but for those who continue in public service.

# 20 for Chicago

The parade is on! City after city chooses the Model "40" Sweeper. Chooses it for its exclusive three-wheeled design with front steer and rear dump . . . for its NO CONVEYOR feature with patented deflector bar . . . for its 36" bump proof oscillating gutter broom . . . for its exclusive hopper flushing device. Sweeping width is 7′ with one gutter broom (right-hand or left-hand); 9′ with two gutter brooms. A Leaf Broom attachment solves the leaf problem.

Your nearby Austin-Western distributor will be glad to tell you the whole story of this most modern of street sweepers.



All 20 of the Chi… sweepers are fitted w… cabs and doors. Ten have both right-hand and left-hand gutter broom. Ten have right-hand gutter broom only. Model "40" design makes it easy and inexpensive to add a second gutter broom l…

AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS

BUILDERS OF ROAD MACHINERY

Austin-Western

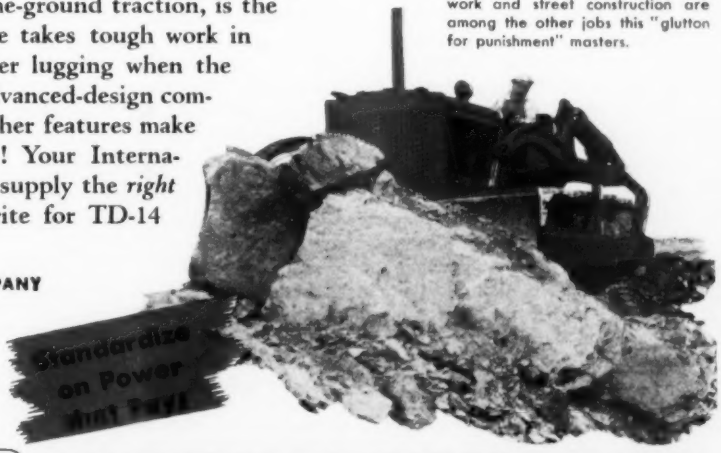
SINCE 1859

A glutton for punishment, powered by a diesel engine with matchless lugging ability and stamina—this is the tractor for you to use on heavy, back-breaking jobs. The International Crawler, with broad-gauge stability, balance and geared-to-the-ground traction, is the worker you need. ● Its powerful engine takes tough work in stride, with increased torque for heavier lugging when the load demands it. All-weather starting, advanced-design combustion, full pressure lubrication and other features make it *your* obvious choice among tractors! Your International Industrial Power Distributor can supply the *right* size with *matched* equipment, now. Write for TD-14 or TD-18 Folders.

**INTERNATIONAL HARVESTER COMPANY**
**Chicago**

*Hear James Melton and "Harvest of Stars" every Sunday—NBC*

An International TD-14 Diesel puts these rocks in their place with its hydraulic blade to clear a highway site. Snow removal, sanitary fill work and street construction are among the other jobs this "glutton for punishment" masters.




**CRAWLER TRACTORS**
**WHEEL TRACTORS**
**DIESEL ENGINES**
**POWER UNITS**

INTERNATIONAL HARVESTER

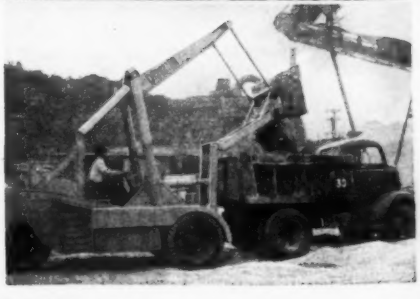
# INTERNATIONAL
## INDUSTRIAL POWER

*When you need special information—consult the* **READERS' SERVICE DEPT.** *on pages 85-89*

# *it* DIGS...*it* LOADS at tremendous savings

Whether you need it for excavation work or loading from stockpiles or both, you need the new low production cost of the Dempster-Diggster. Here is the only small shovel that works on a hydraulic, simultaneous or independent crowd and hoist action and completely eliminates tractive effort in loading with wheels. Its variable crowd action at any dipper position means the Dempster-Diggster can dig lower . . . 15 inches below grade. Exclusive hoisting action means it can dig higher . . . digs out a 15 ft. bank. It's the only small shovel featuring such speed and mobility . . . travels at truck speeds on the road . . . gets in tight places on big jobs, freeing large shovels for heavier work. Ideal for the small and medium size excavation jobs yet powerful and fast enough for big jobs.

Stockpiling or loading work is easy for the DEMPSTER-DIGGSTER. Its speed . . . its 15 ft. turning radius . . . its extraordinary dumping reach help the Dempster-Diggster complete the average loading job in an amazingly short time. Dempster-Diggster buckets are easily interchangeable and are availab'e in three sizes. 1 cu. yd. (heaped) with hardened steel teeth for digging . . . 1½ and 2 cu. yd. for loading and stockpiling work. Power is supplied by a heavy duty gasoline or diesel engine. Hoisting, crowding, steering and braking are all 100% hydraulic. For complete information, write today for Folder Number 8154.



Large photo above shows Dempster-Diggster loading crushed stone. Note how independent crowd and hoist action permits bucket to follow the slope of the material. At right, top: Digging out high bank. Right, center: Closeup of 1 cu. yd. (heaped) digging bucket. Right, bottom: Dumping crushed stone into truck.

**DEMPSTER BROTHERS INC.**

**969 DEMPSTER BLDG. KNOXVILLE 17, TENN.**

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# You should talk to the owner of this truck!

International KB-7 with dump body

THE OWNER of this International KB-7 uses a dozen International Trucks in his engineering work. (Four are dump trucks, 2 flat beds, 1 oil spreader and 5 Concrete Ready-mix.) He knows what they can do, and how well they do it.

**He speaks** from experience when he says:

> "The new KB-7 dump truck is a pleasure to drive, and has been getting 9½ miles to the gallon of gas under conditions which should use a good deal more—that is, a lot of starting and stopping and short hauls."

**And we aren't exactly speaking as amateurs** in the business when we tell you this:

International Trucks are the products of 42 years of real truck engineering. They are available in 22 basic models, 1000 truck combinations, gross weight ratings from 4,400 to 90,000 pounds—to give you the truck that's specialized right for your job. And, they're backed by the nation's largest exclusive truck service organization.

Talk to any International Truck owner. Talk to any International Truck driver. Then you'll know why it will pay you to see your International Truck Dealer for the very next truck you buy. Call him soon.

International Harvester Builds McCormick Farm Equipment . . . Farmall Tractors . . . Industrial Power Motor Trucks . . . Refrigerators and Freezers

*Tune in James Melton and "Harvest of Stars" NBC, Sunday afternoons*

# INTERNATIONAL TRUCKS

INTERNATIONAL HARVESTER COMPANY • CHICAGO


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# PUSH-PULL for POWER PLUS Bucket-Loads

Hydraulically controlled bucket is shown above at load start position. Double action cylinders are placed in power plus horizontal thrust position. Note powerful triangular construction.

Hydraulic Bucket control permits slow or fast dumping. Loaded bucket can be leveled throughout lifting operation. Start of controlled dump is shown in illustration above.

## THE OTTAWA DOUBLE ACTION INDUSTRIAL LOADER

Dual Hydraulic operation throughout. The bucket is hydraulically controlled by a powerful pair of double action cylinders. This feature adds many operational uses never before found in loaders of its price range.

High capacity double action lift cylinders make the Ottawa "Double Action" outstanding in the loader field. Down pressure on lifting cylinders adds excavating to the long list of material handling operations possible with the New Ottawa. Here is a loader that lifts, loads, digs and builds stock piles as well as functioning as a material leveler and spreader.

*Now available for following tractors:*

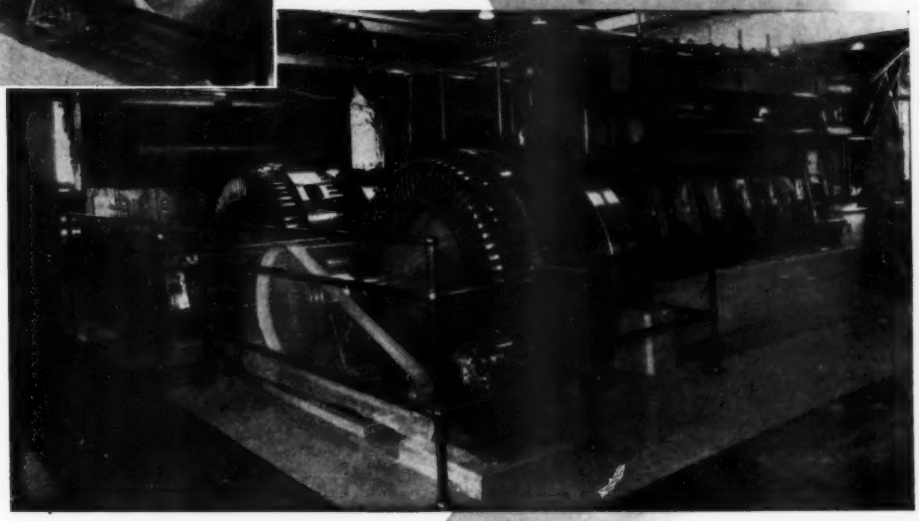
Minneapolis Moline RTI—UTI—UTIL
International Harvester I-4—I-6—ID6—I-9—ID9
Case SI—DI—LAI

It's new—It's a feature your customers have been looking for—It's low cost—
It's economical — Write today for complete details and price list.

The Ottawa INDUSTRIAL HYDRAULIC FRONT END LOADER

**Ottawa STEEL PRODUCTS, Inc.**
INDUSTRIAL DIVISION
OTTAWA, KANSAS • U. S. A.

# Gold is where you find it



● Seven Superior Diesels helped a midwest quarry company find gold—gold in the form of reduced power costs. In only 12 years the use of Diesels reduced the cost of electrical power $156,000, *after all expenses, including depreciation, were deducted!*

But Superior Diesels supplied more than a low cost source of power—they also provided a dependable one. The engines are operated *at least 16 hours daily, 6 days a week, 52 weeks a year!*

Over and over again we hear similar reports about the outstanding performance provided by Superior Diesels. But that's not strange when you consider that Superior has all of the following advantages: Conservative Ratings • Fuel Economy • Precision Bearings • Heavy Rigid Crankshafts • Strong Bases and Cylinder Blocks • Proved Roller Chain Camshaft Drive • Oil Cooled Pistons.

Superior Diesels may be able to help you get gold from your power costs. We would like to discuss it with you—just drop us a line and tell us when it's convenient for you.

**THE NATIONAL SUPPLY COMPANY**
**SUPERIOR ENGINE DIVISION**
**Plant and General Sales Office: Springfield, Ohio**

THE NATIONAL SUPPLY COMPANY — NSCO

*Superior* DIESEL

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# *Figure the Angleflow when you want BIG volume*

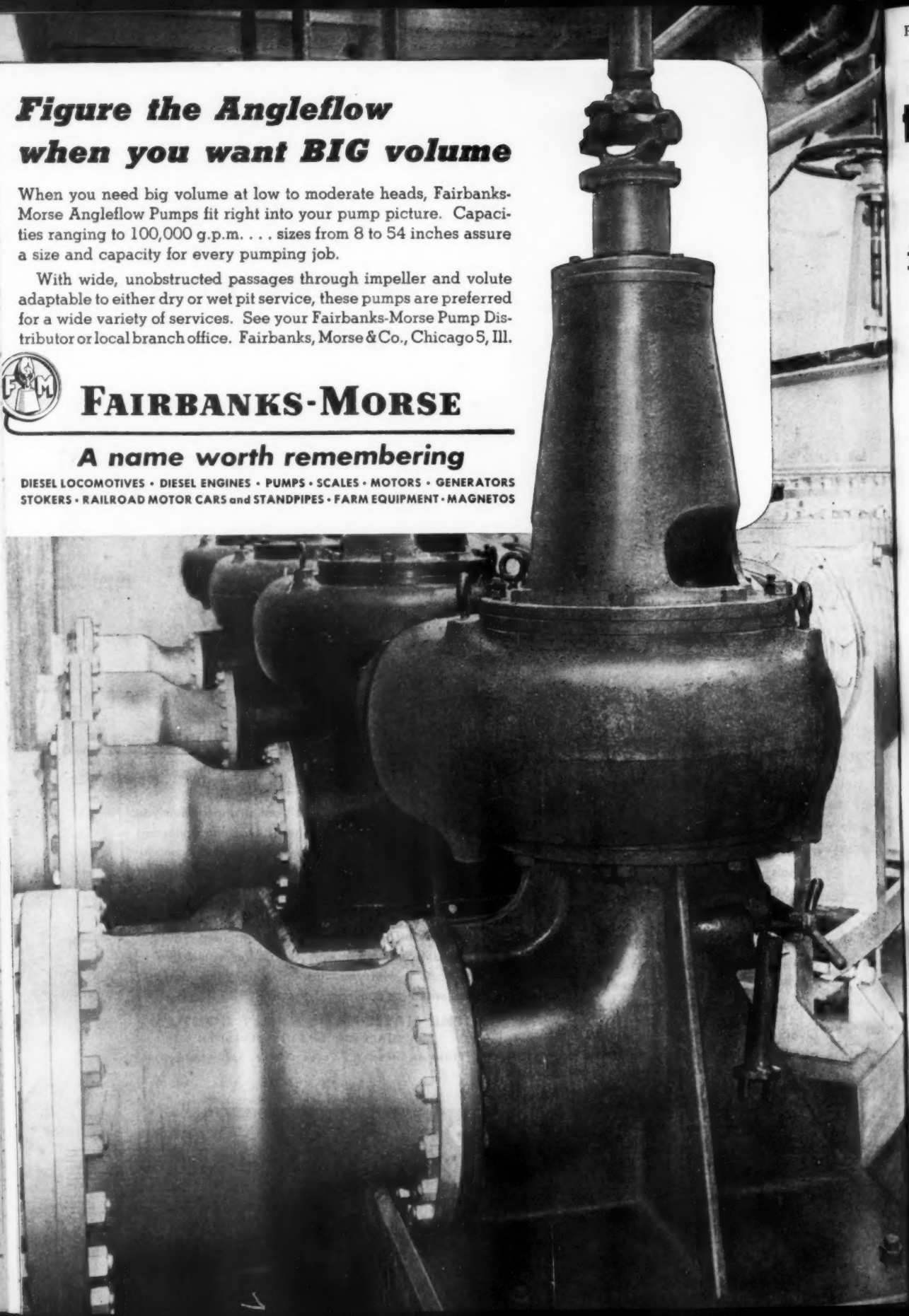
When you need big volume at low to moderate heads, Fairbanks-Morse Angleflow Pumps fit right into your pump picture. Capacities ranging to 100,000 g.p.m. . . . sizes from 8 to 54 inches assure a size and capacity for every pumping job.

With wide, unobstructed passages through impeller and volute adaptable to either dry or wet pit service, these pumps are preferred for a wide variety of services. See your Fairbanks-Morse Pump Distributor or local branch office. Fairbanks, Morse & Co., Chicago 5, Ill.

**FAIRBANKS-MORSE**

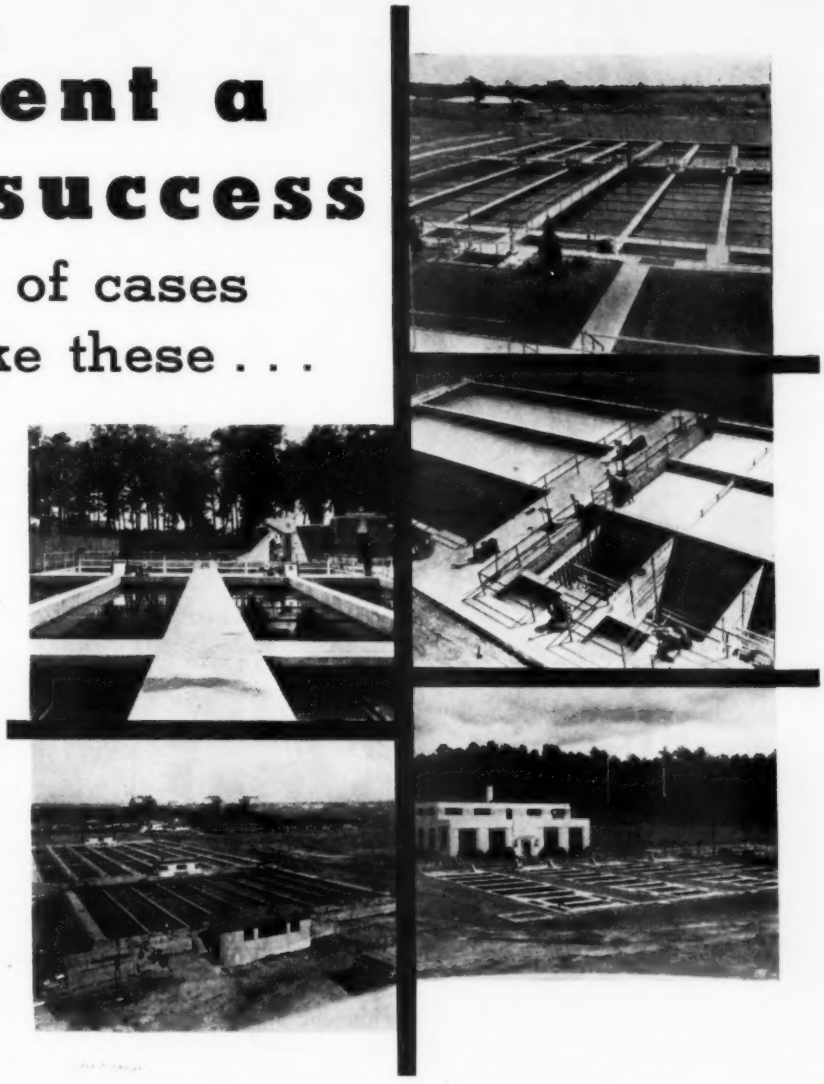
***A name worth remembering***

DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES • MOTORS • GENERATORS
STOKERS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS



# treatment a success

## in hundreds of cases like these . . .



Five Jeffrey-equipped treatment plants are shown here. They include towns and cities serving populations ranging from 1500 to several million. Find out about Jeffrey Collectors, Bar Screens, FLOCTROLS, Grit Washers, Sludge Elevators, Scum Removers, Chemical Feeders, Screenings Grinders, etc.

**When you really want to correct your ills you go to a specialist. That is just good sense. Many cities with growing pains have called in Jeffrey, M D (Mechanically-Designed) for equipment to treat water and sewage effectively. Jeffrey Sanitation Engineers are specialists. You can turn your problem over to them with full confidence for it's a TREAT TO GET GOOD TREATMENT.**

# JEFFREY

ESTABLISHED 1877

JM

SALES OFFICES IN PRINCIPAL CITIES

THE JEFFREY MANUFACTURING COMPANY 947 NORTH FOURTH STREET, COLUMBUS, OHIO

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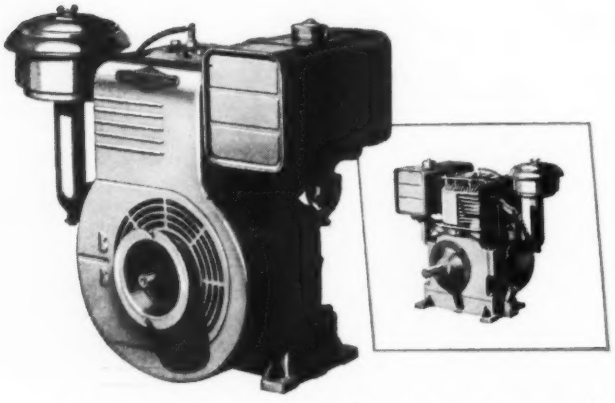
# The Engine Is as Important as the Machine It Powers



It's not enough for a machine or appliance to be skillfully designed, carefully made, and expertly assembled. It has to be *powered* right, too — with the kind of power that will insure the best performance possible year after year.

That's why it will pay you to insist on Briggs & Stratton engines — recognized the world over for dependable 4-cycle, single-cylinder, air-cooled power.

No other engines in the field can assure you such efficient, dependable, low-cost performance. No other engines have satisfied so many customers. No other engines are so universally preferred by manufacturers, dealers, and users alike.

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## Books of the Month

### LAND SURVEYS AND MAPS

This book gets right down to earth when it comes to talking about land surveys and brings to the Editor's mind experiences of many years ago. It discusses the generally unsatisfactory condition of property descriptions as incorporated into deeds. Two aspects of land titles not generally understood are explained—the coordinate system for property descriptions, and the Torrens system of land titles by registration. Practical uses of maps and aerial photographs, are discussed. And by the way, while the Egyptians apparently did not use aerial photographs, they did use plane coordinates as far back as a few thousand years ago. It's a good book, and interesting. By Prof. Fred C. Morris, published by Virginia Polytechnic Institute, Engineering Experiment Station, Blacksburg, Va. Price 75¢.

### TRAFFIC ACCIDENTS

In "The Human Race," published by The Travelers Insurance Company, the grim record of traffic deaths and injuries are lightened by a pictorial presentation of the probable causes of many accidents which burlesque the faults and minor sins of the driving and walking public. Statistics are there too, and many tabulations compare accident records for 1947 and 1948. Single copies or quantities may be obtained gratis from The Travelers Insurance Co., Hartford, Conn.

### CONTROLS FOR WASTE TREATMENT

A 20-page booklet covers the utilization of standard pH equipment for the automatic control of waste neutralization, and describes two available control systems to regulate the addition of reagents so that the pH of the raw waste will be held within predetermined limits. Sent on request. Leeds & Northrup Co., Philadelphia 44, Pa.

### SWIMMING POOL EQUIPMENT

A good 28-page booklet which describes swimming pool construction and equipment for recirculation, filtration, chlorination, softening and pH control. Complete specifications are given for equipment. Permutit Co., 330 West 42nd St., New York 18, N. Y.

**THE MUNICIPAL ENGINEER:**

This is an English book and it is written around the work of the engineer in the average English city. Though many conditions are different than those we have in this country, there is so much sound advice in this book that we would like to have all our readers enjoy it. There is an excellent chapter on "Engineering Aptitude" and another equally good on "Personnel and Administration." We heartily recommend this book by L. B. Escritt, a well-known English engineer. It is published in this country by the Macmillan Co., 60 Fifth Ave., N. Y., and the cost is $2.

**APPLIED HYDROLOGY:**

This is an excellent book, well-prepared and about as interesting as it is possible to make this dry subject, wet though it is. Each chapter is preceded by a detailed listing of topics covered. Perhaps a listing of some of the chapter headings will indicate how much the book covers: Collecting and presenting precipitation data; runoff data; relationships between precipitation and runoff; analysis and synthesis of the hydrograph by unit-graph methods; flood routing; infiltration and hydrograph analysis; and the hydrograph as a function of drainage basin characteristics. By Don Johnstone and W. P. Cross. The Ronald Press Co., New York 10, N. Y. 276 pp. $5.

**ENGINEERING & SCIENCE**

This is a rather remarkable college publication—not a book, not a catalog, but "a career reference book . . . edited with the primary aim of giving a simple and direct presentation of the opportunities . . . for professional training in an engineering college." Emphasis is placed on the necessity for careful consideration in choosing a career and to answer the questions: "What are Engineering and Science" and "Who Should Study Engineering or Science."

For most of our readers this excellent text will have mainly an academic interest, for they are already engineers; but we believe they will be broader and better professional men by reviewing some of the information given here, and in reading of the actual experiences a student will have in the four years of school while preparing for his profession.

This career reference book is published by the Polytechnic Institute of Brooklyn, 92 Livingston St., Brooklyn 2, N. Y. Henry Q. Middendorf is Chairman of Admissions.

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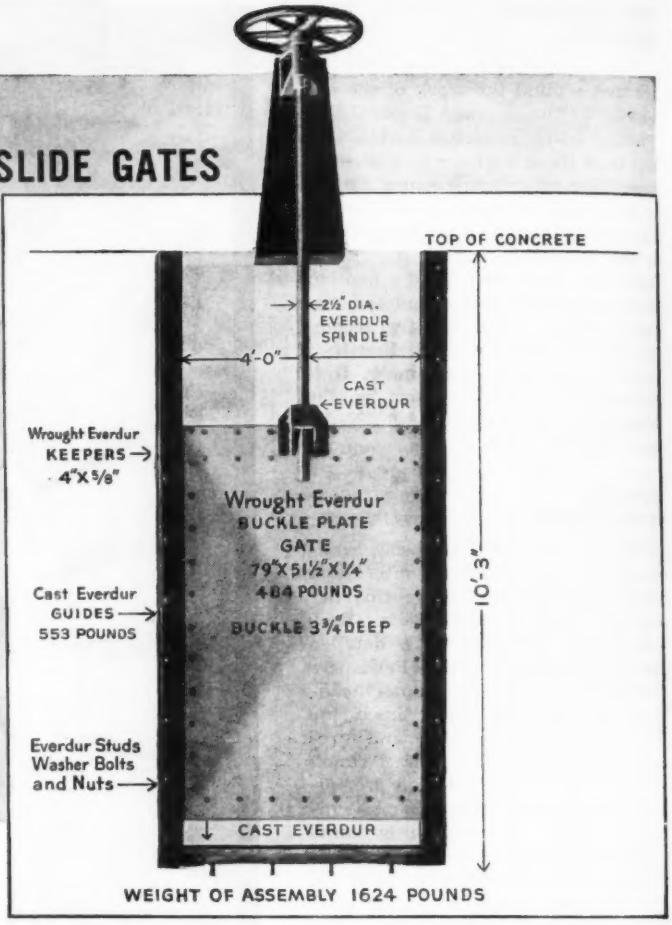
# FROM COTTER PINS TO SLIDE GATES

# Everdur

## STANDS UP LONGER IN SEWAGE SERVICE




*One of the five 13-year-old shut-off gates of Everdur Metal in the screen room of the Rahway Valley Joint Meeting Sewage Treatment Plant.*

For 20 years Everdur* Copper-Silicon Alloys have performed well under the corrosive conditions imposed on sewage treatment equipment. These alloys have unusual resistance to corrosion. In addition, they provide high strength and, according to type, may be cast, hot or cold rolled, drawn, spun, forged or welded.

A good example of Everdur advantages is seen in the five shut-off gates in the screen room at Rahway, N. J., installed more than 13 years ago. These gates, which operate smoothly and easily by hand, weigh 1624 lbs., while cast, electrically-driven gates for the same service would have weighed well over four tons each!

In view of the fact that sewage service must not fail, a cotter pin may be as essential as the most massive equipment. Thus, Everdur Metal has been more and more widely specified for such uses as:

**Coarse and Fine Screens**
**Swing Gates**
**Built-up Sluice Gates**
**Bar Rack Aprons**
**Effluent and Scum Weirs**
**Scum Baffle Brackets**
**Troughs**
**Screen Hoppers**
**Orifices**
**Backets**
**Anchors**
**Ladders**
**Float Gage Chains**
**Valve Springs**
**Manhole Steps**
**Guides**
**Walkways**
**Bars and Plates**
**Bolts and Nuts**

For detailed information, write for Publications E-11 and E-5.

*Reg. U. S. Pat. Off.

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ANACONDA
from mine to customer

Everdur

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**THE AMERICAN BRASS COMPANY**

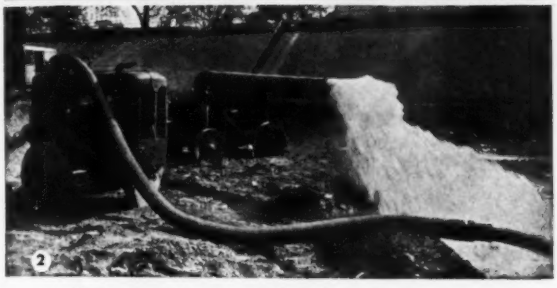
General Offices: Waterbury 88, Connecticut
*Subsidiary of Anaconda Copper Mining Company*
*In Canada:* ANACONDA AMERICAN BRASS LTD.
*New Toronto, Ont.*

# THE JAEGER MACHINE COMPANY

**Columbus 16, Ohio**

***Manufacturers* of Self-Priming Centrifugal Pumps, Air Compressors, Concrete Mixers**

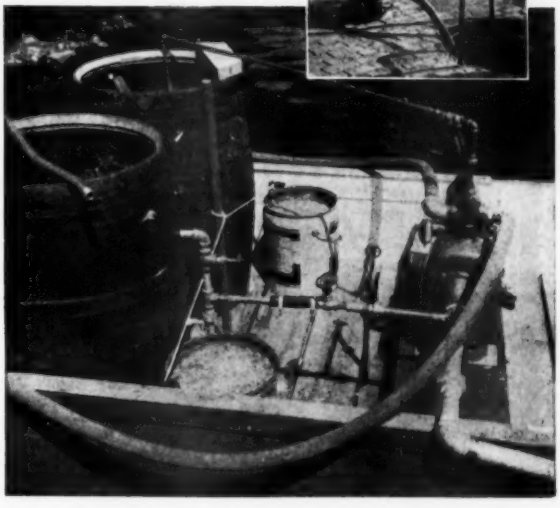
**Distributors in 130 Cities of the United States and Canada**



*Above: Low cost dewatering. River bed excavation drained with suction hose and row of Jaeger pumps.*

Dewatering pumps from 1½" portable aluminum "Bantam", for manhole pumping and small surface spraying outfits, up to 10" portables of 240,000 gph. capacity for largest excavations, by-passing sewers, big well point installations, etc. All models have doubly-sure fast priming effected by two independent, simultaneous actions, portable or stationary mounting, Pressure-type pumps available for jetting and supply pumping.

Jaeger "Bantam" pump operating efficient small spraying unit for algae control. Courtesy Wisconsin State Board of Health.



**Pumping Raw Sewage — One Million Gallons a Day:**

As a "temporary" installation, this Jaeger 6" pump ran continuously for 9 months, transferring sewage from a large State University Student Housing Center to a city sewer at a higher elevation 700 ft. away. Intake was 17 ft. below pump.

**"New Standard" Air-Plus Compressors — deliver 15% to 20% more air to operate today's air tools at full pressure and efficiency.**

Because the "old standard" ratings of 60, 105, 160, 210, 315 and 500 cfm, established back in 1932, no longer match air tool requirements, Jaeger has taken the lead in offering new capacities large enough to maintain full 90 lbs. pressure behind the tools they are designed to operate instead of mere 70 lbs. These "new standard" capacities are 75, 125, 185, 250, 365 and 600 cfm. Their steady higher pressure increases the speed and hitting power of pavement breakers, clay spades, sheeting drivers, backfill tampers, drills, etc. to the point where they will do 30% to 40% more work. Because engine speed is automatically regulated to the air demand, these compressors use no more fuel than others when their extra capacity is not being used.

***Write for complete catalog and name of nearest distributor.***

**When you need special information—consult the READERS' SERVICE DEPT. on pages 85-89**

# YOU CAN OPERATE BOTH HIGH CYCLE AND STANDARD 110 VOLT TOOLS

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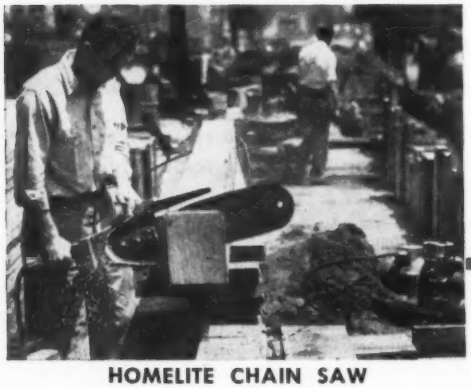
# HOMELITE

## *Carryable Gasoline-Engine-Driven Generator*

## *...A WIDE-OPEN FIELD FOR GREATER SAVINGS*

HOMELITE PAVING BREAKER



HOMELITE CHAIN SAW

Because they do more work and weigh less . . . because maintenance costs are cut in half . . . high-cycle tools are being used on more and more construction jobs . . . concrete vibrators, grinders, impact wrenches, chain saws, electric paving breakers and an ever-increasing number of others. They are indeed the last word in greater efficiency.

And here is Homelite's answer to those who want to cash in on the advantages of high cycle tool operation. It's a compact gasoline-engine-driven dual-purpose generator . . . the first and only one of its kind . . . a complete power unit you can pick up and carry to operate your high cycle tools *any place you want.*

### NO LOSS ON PAST INVESTMENTS

Even though you have made substantial investments in standard 110 volt tools, you have nothing to lose. For this Homelite Generator operates *both* high cycle and standard universal tools with equal efficiency.

*Look into this new Homelite Dual Purpose Generator... the Carryable Power Plant of the Future. Send for bulletin... or, better... let us give you a free on-the-job demonstration. Write, today.*

# HOMELITE CORPORATION

**CARRYABLE PUMPS · GENERATORS · BLOWERS**

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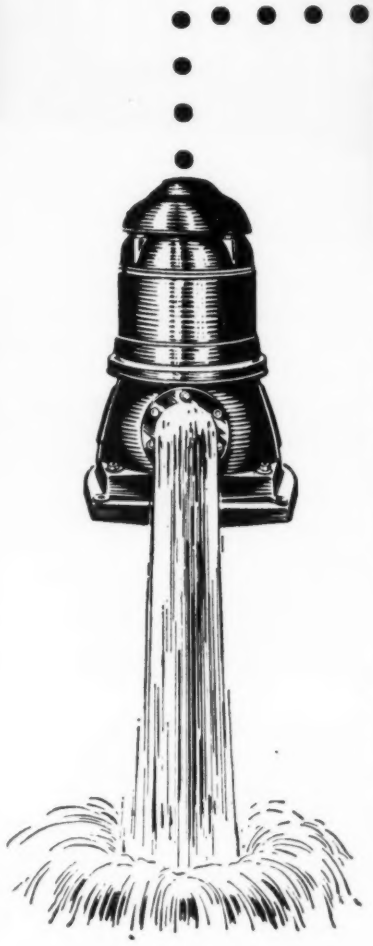
# WE'LL STICK TO *Basic Ideas* IN DESIGN, CONSTRUCTION AND MATERIALS



It is a fine thing to propose wonderful theoretical ideas about well water systems and vertical turbine pumps, but Layne never ventures away from common everyday basic ideas. That fact may account for the world-wide use and popularity of Layne Well Water producing equipment. It certainly accounts for such things as high efficiency, rugged construction and good old reliability of operation. So until the impossible happens, you can be sure that Layne engineers and designers are sticking to basic ideas that always pay off in satisfaction to the user.

Of course Layne Well Water Systems are as modern as tomorrow, in that they are properly designed and then constructed of the finest tested and proved materials. Furthermore they are as accurate in precision building as modern tooling and experienced workmanship can make them. Their excellent qualities have set a standard by which others are almost always compared.

In buying a well water system, you naturally want a full dollar's worth of value. You want a maximum amount of water at a minimum of daily operation cost—plus freedom from breakdown and repair expense. Those requirements just about sums up exactly what you always get when you choose Layne Well Water Systems and Layne Vertical Turbine Pumps. Basic ideas never seem to change.

## VERTICAL TURBINE PUMPS

Layne Vertical Turbine Pumps are available in sizes from 40 to 16,000 gallons of water per minute. These pumps, as a rule, can be installed in wells already drilled, thus gaining higher production without heavy expenditures. Write for pump catalog.

*The Layne Organization offers a complete service in the designing and construction of Well Water Systems, including surveys, water strata explorations, well drilling and pump installation. For further information, catalogs, bulletins etc. address Layne & Bowler, Inc., Memphis 8, Tenn.*

# LAYNE WELL WATER SYSTEMS

**AFFILIATED COMPANIES**—Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ Layne-Texas Co., Houston, Tex. ★ Layne-Western Co., Kansas City, Mo. ★ Layne Minnesota Co., Minneapolis, Minn. ★ International Water Corp., Pittsburgh, Pa. ★ International Water Supply, Ltd., London, Ont. ★ Layne-Hispano Americana, S.A., Mexico, D.F.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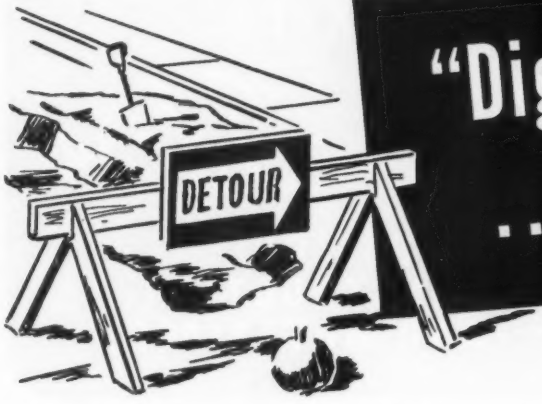



# "Digging In" is Out ...On Main Street

It is no longer necessary to hang out the detour sign on busy, important streets when installing sewers and other underground structures. The easy, economical way is to tunnel the job with ARMCO Liner Plates. Then surface traffic continues as usual.

Although amply strong, ARMCO Liner Plates are light in weight and easy to handle. A single unskilled workman can carry, hold and bolt these sturdy sections into place. No special tools are required and all assembly is done from the inside. Jobs go fast and labor costs are low.

You also save in other ways. Less bulk means less excavation and you buy no excess metal. Hauling and storage costs are low as the plates nest together to save space.

Try tunneling that next job with ARMCO Liner Plates. You'll find it the easy, economical way to put in sewers, conduits, water or gas lines, and similar installations.

Write for prices and other data. Armco Drainage & Metal Products, Inc., 2825 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

**ARMCO TUNNEL LINER PLATES** ARMCO

PUBLIC WORKS MAGAZINE

JUNE • • 1949
VOL. 80 NO. 6

# • DIRT DELIVERY

## *Pays Cost of Cleaning Ditches*

**EVERETT LANHAM**

**County Surveyor and Highway Supervisor, Greensburg, Ind.**

THOUGH we have long seen the need for keeping our highway ditches clean and for removing the berms that build up along the edges of our roads, there has been, until recently, no equipment available for doing this work quickly. In this part of Indiana, one of our greatest highway maintenance problems is the provision of good drainage in roadside ditches.

In August 1947, we bought an Athey force feed loader and we used it the remainder of the 1947 season with our regular men and at those times that other work was not too pressing. In all, we operated it 30 days, and we disposed of 4,600 truck loads of dirt in addition to that used for widening fills. In 1948, we started the work earlier, but still operated the loader only with our regular crew and on days we could spare from other work. With it, we removed more than 7,000 truck loads of dirt.

I conceived the idea of making a service charge for delivering dirt to property owners in our towns and to farmers along our roads. This dirt was used for filling lots, ditches and holes. We delivered dirt in quantities of from one load per customer up to 445 loads to a customer. We charged $1 to $1.25 per load, depending on the length of haul. The price we charged is less than the cost to property owners of having dirt loaded into a truck.

### *Delivery Service Is Popular*

This dirt delivery service is very popular and the people who live along our roads keep asking us when we are going to work their roads and to be sure to haul them some dirt when we do. The delivery is more than paying the cost of removing the dirt, and the good that we are doing our roads is all extra profit. I am trying to put all of the money we receive from hauling this dirt into buying new equipment. This past year we purchased a new grader to do our ditching. If our present finances would permit us to hire a dirt crew and keep this crew at ditch cleaning work every day all summer, we would soon have our roads in a satisfactory condition, and our maintenance costs would be reduced.

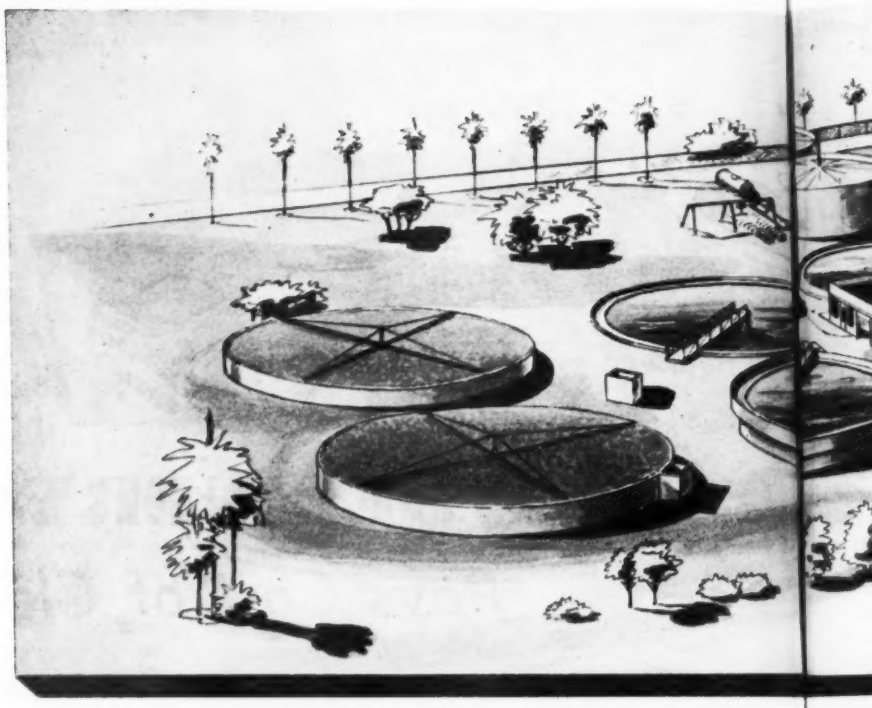
Our county has 667 miles of county roads, and so far we have been able to work over the ditches of only about 100 miles. We use one motor grader to pull the dirt from the ditches and another for windrowing the material and cleaning up. We use from 5 to 9 trucks for hauling dirt. The Athey loader picks up the windrow and loads the dirt into the trucks. When working conditions are good, the loader will fill a truck in two minutes, and will average from 150 to 200 truck loads a day. We use all the dirt we need for widening our roads, but when we get over 100 truck loads per mile, we cannot use it all for that purpose, and we sell what we do not need.

We have about 200 miles of black top roads. Some of these were among the first that we ditched, and we noted that these came through the winter in better condition and required much less patching and maintenance than did the sections on which ditches were not cleaned.

In both 1947 and 1948 we were unable to keep up with the orders for dirt and we have gone into both winters with many orders unfilled. While we have accomplished a lot, our county is hilly and has a quick run-off, so that the ditches keep filling with dirt. We have to keep at the job all of the time, but modern equipment makes it possible to do the work much more quickly and economically than we were able to do it before.

# ORLANDO *builds biggest high rat*

***Converting twelve sewer systems into three; installing automatically controlled pumping stations; and designing and building a sewage treatment plant with many unusual and interesting features are described in this article. The author is a member of the well-known firm of Smith & Gillespie, who are consulting engineers for the city.***



● ***ORLANDO'S SEWAGE treatment plant as seen by the artist. The sludge drying beds are at the upper***

**C. WALLACE SMITH**

**Smith & Gillespie, Consulting Engineers, Jacksonville, Fla.**

CONSTRUCTION of a modern sewage treatment plant is now under way in Orlando, Fla., replacing the former method of discharging sewage through drainage wells into the ground water. The new plant, which will employ high rate filtration, is a part of a program which includes reconstruction of the sewer system and building of four sewage pumping stations. Flows as high as 16 mgd can be handled by the new plant. The present summer population of Orlando is 60,000 and the winter population is 90,000. It is estimated that the winter population will reach 110,000 by 1960.

### *The Sewer System*

Orlando's sewage collection system has been constructed more or less piece-meal over a period of some thirty-six years. After the original installation of sewers in 1913, the largest single program of sewer construction was during the real estate boom of 1924-1926. Sewer lines total about 155 miles, and due to failure of some of the lines laid during the "boom" period, there is a large amount of ground water infiltration, especially during rainy seasons.

The original sewer layout comprised no less than twelve physically separate gravity systems, each discharging into drainage wells drilled at the lower end of the system. Before discharge into these drainage wells, the sewage was passed through settling tanks, which were inadequate in capacity, so that solids removal was low. Due to the pollution of the underground water by this system, the city was ordered to discontinue it by the State Department of Health. Smith & Gillespie, consulting engineers of Jacksonville, were engaged to investigate conditions and prepare plans for a modern sewage treatment plant.

Following a careful study of local conditions, it was determined that the twelve sewerage systems could be combined into three by means of interceptors. These interceptor lines are of vitrified clay. They were designed on the basis of the ultimate capacity expected when the areas served by them were fully developed. Gradients provide a minimum velocity of flow, when half full, of 2 ft. per second. Sizes are from 12-inch to 30-inch. Lengths of interceptors total 34,000 ft. GK poured joints were used and the lines laid carefully and tested for ground water infiltration.

Trench excavation was by dragline and backhoe. Because of the rather high ground water level, it was necessary to use well-points to dewater most of the trenches during construction.

### *Pumping Stations and Pressure Lines*

The new interceptors deliver the sewage to three modern pumping stations. These deliver through force lines of 20-inch cast iron pipe to a fourth or booster pumping station from which the sewage is forced to the treatment plant. The pumping stations are of concrete below grade, with a masonry superstructure. Each station has three pumps set in dry pits. The pumps are of varying capacity and the operation is automatic on a programmed control determined by the quantity of sewage flow. Two pumps in each station are equipped with stand-by gaso-

# ...trate filter in the SOUTH . .

***right . . . At the center top are the two floating cover digesters. In the center are the four clarifiers, with the primary and secondary filters at either side. Office and operating buildings are also shown.***

line engine power for operation during power outages. The engines have Synchro-Start mechanisms so that they will automatically start and stop without requiring the presence of an attendant. The pumps equipped with dual power units are able to meet peak flow requirements when operating on an engine drive at a higher RPM than when motor driven. Each station is preceded by a sand trap and a comminutor, and is equipped with chlorination facilities for odor control or for prechlorination of the sewage.

The fourth pumping station is a booster station. It receives the discharge from the three pumping stations and delivers the sewage to the plant. The need for this station was determined by an economic weighing of the original cost of the pressure lines, friction losses, operating heads and power requirements.

The 20-inch force lines from the three district pumping stations to the booster station are cast iron bell and spigot pipe, and the total length is about 23,000 ft. From the booster station to the plant, 11,000 ft., the line is 30-inch cast iron. For the most part, these force lines were laid in trenches excavated by a trenching machine, and have a minimum cover of 24 ins. Lead joints, caulked with compressed air, were used. Air relief valves are located at all high points in the force lines, and gate valves are so placed as to isolate the lines into sections approximately 1,000 ft. long.

The contractors for the sewer lines and the pumping stations included Blythe Bros. Co., Charlotte, N. C.; Bumby & Stimpson, Orlando; Higgins, Inc., Sarasota, Fla.; and Hubbard & Langston Construction Co., Orlando.

### *The Sewage Treatment Plant*

The sewage treatment plant, which is now under construction, is located about two miles from the business section of the city and adjacent to the sewage treatment plant serving the Air Forces Tactical Center. The plant is of the biofiltration type, and is designed to treat an average flow of 8 million gallons per day, and a maximum of 16 mgd. Analyses of the sewage indicate an average suspended solids content of 326 ppm and an average BOD of 350 ppm. Some citrus wastes enter the sewer system, accounting, in part, for the strength of the sewage.

The force main discharge into a diversion and surge chamber near the primary clarifiers. There are two primary tanks, each 120 ft. in diameter and 11 ft. 0 ins. sidewater depth, providing a detention period of 2.6 hours, based on a flow of 8 mgd plus a recirculation ratio of 1.25 to 1. The overflow rate is 800 gals. per day per sq. ft. The tanks are equipped with mechanical skimmers.

There are four filters, two primary and two secondary. These are all identical, 120 ft. in diameter and with a 5-ft. depth of 1½ to 4-inch slag. Vitrified clay underdrains are used.

The secondary settling tanks are also 120 ft. in diameter, and have a sidewater depth of 9 ft. 0 ins. These provide a detention period of 2.5 hours and an overflow rate of 710 gals. per day per sq. ft., based on a flow of 8 mgd and a recirculation ratio of 1:1.

## LEADERS IN THE PUBLIC WORKS FIELD

★

Likable and popular President of the Construction Industries Association, which is affiliated with the American Road Builders' Association, Ralph K. Stiles has been in the equipment business since 1919. Active in the sales program of Austin-Western Co. since 1932, he has been Executive Vice President of Austin-Western for the past several years and an active member of the ARBA. He has contributed materially to the program for more and better roads to meet the needs of industry, commerce and recreation.

RALPH K. STILES

For design purposes, BOD was assumed as 350 ppm, with a removal of 35% in the primary, giving an applied filter loading of 1.8 pounds of BOD per cubic yard of stone, or about 2,900 pounds per acre foot. It is expected that the overall removal of BOD will be at least 92%, which would give a final effluent less than 28 ppm.

Recirculation for the primary stage is provided by two 5 mgd pumps while the secondary recirculation is by two 4 mgd. pumps.

### *Sludge Digestion and Disposal*

Sludge from the secondary clarifiers is pumped to the inlet of the primary clarifiers. Primary sludge goes to the digesters. There will be two digesters, equipped with floating covers. These will be 75 ft. in diameter and 25 ft. sidewater depth, providing 3.5 cu. ft. per capita digestion capacity. Gas will be collected and utilized to drive a 180-hp gas-diesel engine, which will be direct-connected to a generating unit. It is expected this will provide enough power to operate the entire plant. The digesters will be heated through heat exchangers by the jacket water from the gas engine. A production of 1 cu. ft. of gas per capita per day is anticipated.

Drying beds are provided for dewatering the sludge and these will be equipped with belt conveyors for moving the dried sludge to a loading hopper. There appears to be a considerable demand for the dried sludge by the Park Department, nurseries and golf clubs.

The plant effluent will be discharged through a 42-inch concrete gravity line 6½ miles long to one of the branches of the St. Johns River.

The overall basis of design is for 80,000 population contributing a per capita flow of 100 gals. per day, and on this basis the cost is about $12 per capita. However, all hydraulic elements of the plant are designed to handle flows up to twice the design flow. On the basis of 0.167 pounds of BOD per capita, the plant can handle the wastes from approximately 140,000 people.

The successful bidder for constructing the plant was the Ivy H. Smith Co., Jacksonville, Fla., who was low among eleven bidders with a bid of $972,848. It is anticipated that the plant will be ready for operation early in 1950.

Principal equipment in the plant includes: two 120-ft. diameter Dorr primary clarifiers; two 120-ft. diameter Dorr secondary clarifiers; four 120-ft. Dorr distributors, two primary and two secondary; two 75-ft. diameter Pacific Flush Tank floating covers for the digesters; four Fairbanks, Morse recirculation pumps; and one Wallace & Tiernan chlorinator.

### Sickness Outbreak Follows Lack of Chlorination

A few weeks ago the hypochlorinator of the Loudonville, Ohio, water supply failed to work, and the following day about 30% of the population came down with nausea, vomiting and diarrhea. The epidemic was reported to the State Department of Health, which ordered the supply to be shut off, the water in the reservoir to be chlorinated heavily, and emergency repairs to be made to the hypochlorinator—they had no duplicate chlorinator, but have since added a gas-type chlorinator.

The cause was traced to an old sewer that passed within 5 ft. of one of the four wells that supplied the village, the water from which showed B. Coli in every sample tested.

● ***RIG MOUNTED on half-track placing 20" cast iron pressure sewer.***

# 6 Conclusions

## from a Bacteriological Study of Swimming Pool Waters

PHILIP N. ALBRIGHT, Public Health Engineer,
A. B. RICH, DVM, Public Health Laboratory Director,
Health Department, San Antonio, Texas

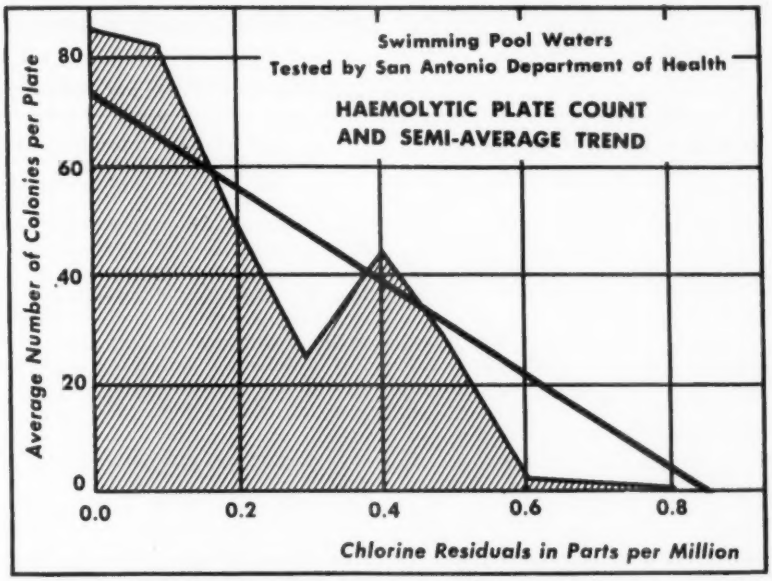
EXTENSIVE checks on the quality of swimming pool waters through specially planned laboratory analyses were conducted in the San Antonio area during the summer of 1948. This study was made partly for research purposes and partly as a check on the water quality. Our method of laboratory examination included haemolytic and total plate counts because the occurrence of coliform organisms in swimming pool waters was rather infrequent, and we felt it desirable to check for other organisms of pathological importance.

The following method of examination was used: For the coliform plate count, desoxycolate medium was employed; one cc of water sample was used with 10 to 12 cc of agar; incubation was for a period of 48 hours, following which coliform colonies were counted. For the haemolytic and total plate counts, a blood agar plate with sodium azide (1:2,000) as a coliform inhibitor was used, with 1 cc of sample to 10 to 12 cc of blood agar; incubation was for 48 hours, following which total and haemolytic colonies were counted separately.

For the purposes of this study, 804 samples were taken from 15 pools; however, only 554 samples from 13 pools are considered because this was the number of samples that were taken at the same time that residual chlorine checks on the pool water were made and recorded. The 250 samples not considered were those for which corresponding residual chlorine tests were not available.

### *Results of the Study*

The results of the examination of the 554 samples show quite well the condition of the pools throughout the season. The average free chlorine residual was 0.33 ppm, which indicates both a definite residual and effective chlorination. Of the 554 samples, only 130, or about 24%, showed "innumerable" plate counts, in spite of the fact that the periods of changing water in these pools ranged from two to three weeks, and that there was no filtration or recirculation (except for two pools). Only 153 samples, or about 27.6%, showed a positive plate count in excess of 300 colonies. There were 231 samples (41% of the total) with less than 10 colonies. In only 77 samples, or 14% of the total, were the presence of haemolytic organisms shown, with counts ranging from one to, in a very few cases, "innumerable." Only 7 samples of the 554 showed the presence of organisms of the coliform group.




● ***FREE CHLORINE RESIDUAL** of about 0.8 ppm destroys haemolytic organisms. Chart shows reduction obtained at various residuals.*

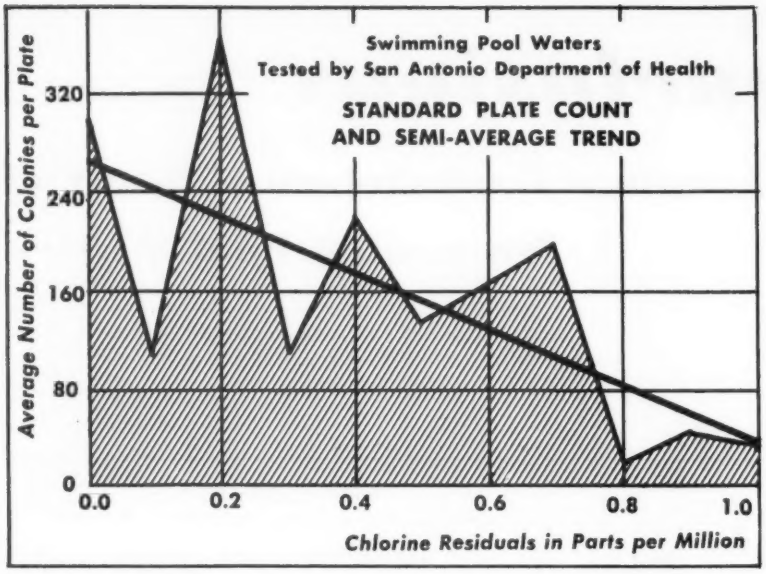
In comparison, 61 samples, not included in the above data, were taken from a pool which was not chlorinated at any time. Of these, 9 or 15% showed coliform organisms; 62% showed the presence of organisms of the haemolytic type, exclusive of coliform haemolytics; and 48% showed a standard plate count in excess of 300 colonies.

Our observations, based on the record of weather conditions made at the time of taking the samples, indicated that when there was a combination of high wind and unusually dry and dusty soil conditions, the number of haemolytic organisms in the samples increased considerably. This was also true, but to a lesser extent, when leaves and trash were blown into the pools.

### *Conclusions From the Study*

In studying the data that were accumulated, a number of tentative conclusions have been reached:

1. Increasing the free chlorine residuals is more effective in controlling the growth of organisms of the haemolytic type than it is for other




● ***PLATE COUNTS of swimming pool waters plotted against free chlorine residuals, showing effect of adequate chlorination.***

organisms. This is probably a most valuable characteristic due to the fact that many of the haemolytic organisms are pathogenic on or in the human body.

2. Even when there is a low incidence of positive coliform organisms, the increase in the free chlorine residual has a markedly beneficial effect, according to the relatively few samples covered in this study.

3. In spite of the fact that the pools studied were subject to various degrees of skill in operation, no selection having been made on this basis, there is still definitely indicated the beneficial effect of the increased chlorine residual.

4. While it may be assumed that absolute sterility of swimming pool water is desirable, there is nothing to indicate that the presence of a limited number of non-pathogenic organisms are detrimental to the swimmer.

**5. Since the semi-average trend, in plotting the average number of haemolytic colonies against free chlorine residual in ppm, indicates that the zero point is reached at a chlorine residual concentration of a little over 0.8 ppm, it does not appear that residuals greater than this should be necessary.**

6. It is our feeling that the check for haemolytic organisms in swimming pool water is more important than the check for coliform organisms. A comparison between the semi-average trend lines of the coliform curve and the haemolytic count curve, indicates that the haemolytics show a more rapid response to control by residual chlorine than do the total organisms. This is to be expected, since the total count may include organisms derived from spore-formers which are not killed by small chlorine dosages.

It is planned to continue this work during the coming summer, and to carry on also an intensified investigation into the causes of ear, eye, nose and throat infections that appear to have a history connected with the use of a swimming pool. Efforts will be made to obtain further data along the lines of those obtained in 1948, and to organize the data from both years for the purpose of arriving at more definite conclusions.

## Selecting Metallic Tapes

Woven metallic tapes are used by the engineers of the California Division of Highways in places where great accuracy is not required, at the rate of approximately 1600 a year. The Stores Department, through which all materials for the Division of Highways are obtained, asked the laboratory to investigate the commercial tapes now obtainable with a view to preparing specifications whereby purchase of such tapes might be made in a rational manner. The methods employed in testing tapes, results obtained and specifications proposed are described by Glenn Morgan, testing engineer, and M. Harris, stores engineer, in the official journal of the Division, *California Highways & Public Works*, in an article of which the following is a brief abstract.

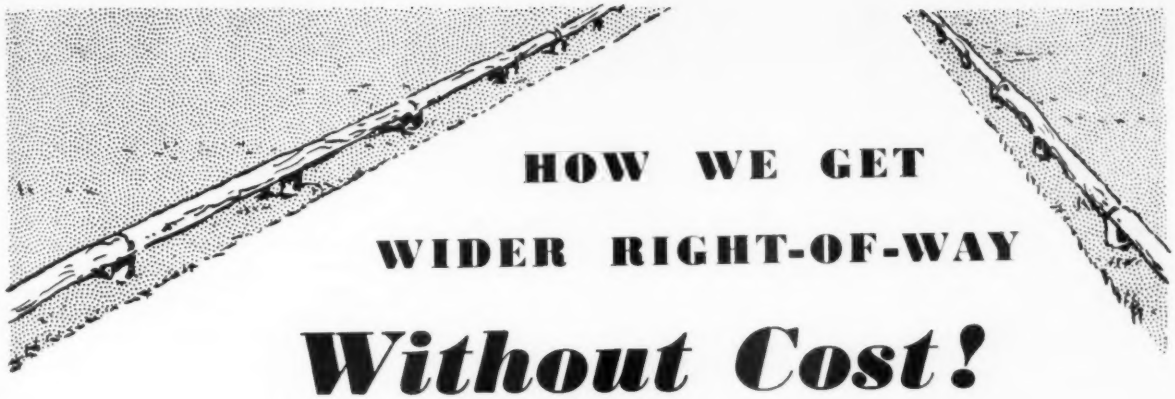
The physical properties considered were resistance to wear, accuracy, tensile strength, readability as shown by height of numerals and color contrast, and general construction to withstand various field conditions.

To determine resistance to wear, a machine was devised in which a 10-ft. length of tape with its ends sewn together to form an endless belt, and kept wet, passes over a system of abrasive wheels which revolve both with and against it and which subject both sides to abrasion as it moves over them at the rate of 380 ft. per min. Each belt is removed after 1,500, 3,000 and 3,500 complete revolutions, washed gently, dried and weighed, and the loss of weight recorded to 0.5%. At the end of the test of each tape section, its length is measured both wet and dry.

Of four different makes that were tested, the best and worst gave the following average results: Original error of 50 ft. tape, 0.010 ft. and 0.055 ft. Tensile strength of tape, 165 lb. and 110 lb.; and of ring, 85 lb. and 70 lb. Abrasion loss, 17.2% and 47.5%, the latter having failed at 1500 cycles. Change in length: wet —0.05% and + 0.60%; dry — 0.25% and + 0.35%.

All were weak in the end section, three breaking at the rivet hole, and it was recommended that the ring portion be redesigned so that its tensile strength will be equal to that of the remainder of the tape; the first two feet being reinforced with the same material as is used in the body of the tape. It was also recommended that the main numerals be approximately ½" high and imprinted with a medium that will withstand wear consistent with the body of the tape.

Among the requirements of the proposed specifications are that the ribbon be completely impregnated and covered with a moisture-resistant coating, and have a breaking strength of not less than 115 lb., this including the reinforced end section and metal ring. Numerals shall be a minimum of ½ inch in height and so imprinted as to be readable throughout the abrasion test, and not fade, crack or scale off in storage. The error in length of a fully-supported tape under a tension of 3 lb. shall not exceed 0.170 ft. per 100 ft. A tape tested for abrasion for 3500 cycles as described above shall not lose more than 25% in weight; and the error in length, wet or dry, shall not exceed 0.75%.



# HOW WE GET WIDER RIGHT-OF-WAY *Without Cost!*

**EDWIN P. KNAPP**
County Engineer, Smith County, Kans.

A UNIQUE right-of-way plan has been developed by Smith County, Kansas, for new construction or reconstruction. It is universally agreed that wide right-of-way grants are conducive to design and construction of safer highways. Local road construction has been limited in design by insufficient widths often established many years ago. In those isolated cases where provisions were made to acquire greater widths for rights-of-way, the excessive costs required to maintain these additional widths over a period of years often prevented their acquisition.

Under present conditions, a right-of-way 70 feet wide is obtained for all of our county highways by dedication deed and without payment for the land. However, when new construction or reconstruction is planned, each land owner is presented with an easement form which grants the county permission to exceed the right-of-way limits for a distance of 15 ft. on either side for purposes of construction or reconstruction. Thus we have a right-of-way 100 ft. wide for construction purposes, but only 70 ft. wide for maintenance. In return for this easement, the county removes all existing obstructions from the premises; and when construction is complete, it resets all fences on the original location. Where pasture land is involved, a temporary fence is maintained until such time as the permanent fence is replaced. The easement is drawn for not to exceed two years.

The rough terrain we have in Smith County requires numerous cut-and-fill sections to produce satisfactory sight distances and grade. Under such conditions, the availability of extra right-of-way width which, if not needed, can be returned to the owner, is extremely desirable; and unless actually needed, there is no future maintenance cost for the land.

### *Equipment for Road Construction*

Because of the rough terrain and the considerable amount of excavation required, we depend on carryall scrapers, bulldozers and motor graders for the major portion of our construction. We operate an elevating grader wherever practicable; however, the greater portion of its time is utilized for "casting in" township roads where the sight distance and grade are of minor importance due to the low traffic volume.

The accompanying pictures were taken on a 5-mile road construction project which was completed, with the exception of the surfacing, during the summer of 1947. This project involved replacement of one bridge on a new alinement; construction of three 6′ by 8′ box culverts and two double 6′ by 10′ box culverts, all of reinforced concrete; and the installation of corrugated metal pipe culverts ranging in size from 24″ to 36″.

The bridge has a span of 28 ft., with a 24-ft. wide roadway. It is of reinforced concrete and replaces an old wood and steel structure. The bridge footings were carried to rock formation inside of steel sheet piling, which was driven with swinging leads and a drop hammer from a Hystaway attachment mounted on a D7 Caterpillar tractor. The Hystaway attachment was also used for excavating the footings, utilizing a clam shell bucket for this work.

● ***TRACTORS and carryall scrapers are used for major grading work. Rough terrain of Smith County requires numerous cuts and fills.***

After excavation, forms were constructed and the abutments poured. One of the abutments had to be formed and poured inside of the steel piling, while on the other it was possible to remove the piling, construct the forms and pour the abutment.

The highway was constructed with a 26-ft. roadway, with shoulder slopes 3 to 1. All bank slopes, excepting extreme cut sections, had a

● ***DROP HAMMER from attachment mounted on crawler tractor drives sheet piling for footings of new reinforced concrete bridge.***

● ***SMITH COUNTY equipment at work on 5-mile road project featured by flat shoulders and replacement of bridge for better alinement.***

slope of 3 to 1. Due to the flat shoulder and bank slopes, no effort was made to obtain a flat ditch section. The 3 to 1 shoulder slope creates some additional expense in cross-pipe drainage; however, the lower maintenance cost resulting from the flat shoulder slope justifies the initial added drainage cost.

The surface, when placed, will consist of 800 cu. yds. of sand gravel per mile; this will be spread uniformly over the entire roadway width; scarified and thoroughly mixed to a depth of 4 ins.; then laid down to grade and compacted. In this construction, water is added, when necessary, to obtain satisfactory compaction. A windrow of 200 cu. yds. of sand gravel per mile is placed on the shoulder for maintenance purposes and for use as a stabilizing agent during wet weather. This type of highway design gives us a maximum of safety and usability per construction dollar; and it is also adaptable to a high-type surface when and if traffic conditions require. It is also pleasing in appearance and well received by the public.

## San Francisco Industrial Waste Survey

Major industries in San Francisco were surveyed, starting in March, 1948, to determine the nature and volume of wastes from plant processes and the probable effect these were having on the city sewer and sewage treatment systems. At each industry visited, information was obtained on the following: (1) The type of industry and the processes used; (2) the volume and composition of plant wastes; (3) present facilities for treating plant wastes prior to discharge; and (4) the point at which wastes are now being discharged, as into the city sewers or the bay.

During the same period an examination of the bay shore in the southerly portion of the city was made to ascertain the effect of waste discharges. It was found that sludge banks have formed in the vicinity of all the sewer outfalls and industry waste discharge lines.

The information developed by this survey is expected to aid in determining the following: (1) The probable effect of present industrial wastes on the city's sewerage system, particularly as to probable deposits in the sewers calling for additional maintenance work and also the possible deterioration of the sewers themselves caused by the nature of the waste; (2) The probable effect of present industrial wastes on design of the sewage treatment plants, on their operating costs and on the nature of the effluent produced by such plants; and (3) The additional waste treatment facilities which might be required at various industries to avoid damage to the sewers or overloading of the city treatment plant facilities.

During the fiscal year, 380 industries were visited of which 256 were found to have industrial wastes. In the Southeast Sewerage District, where the survey was completed, 176 industries were surveyed, of which 93 had wastes. Of these, 17 required no treatment; 20 had adequate facilities; and 56 should provide additional facilities. The total discharge was about 4 mgd., of which about one-half was discharged into city sewers and one-half into the bay.

## The World's Highest Auto Registration

California registered 4,216,532 motor vehicles in 1948, a total larger than that of any other state or any foreign country, according to the Dept. of Motor Vehicles of that state. The motorists of the state paid $415,250,000 in federal excise taxes in 1948.

## Service Charge for Garbage Grinders

Albany, Oregon, in a new ordinance providing for a sewer service charge, has included an additional charge of 25 cts. per month for each kitchen garbage grinder installed.

# Electric Crane

## REDUCES WAITING TIME ON SEWER TUNNELING JOB

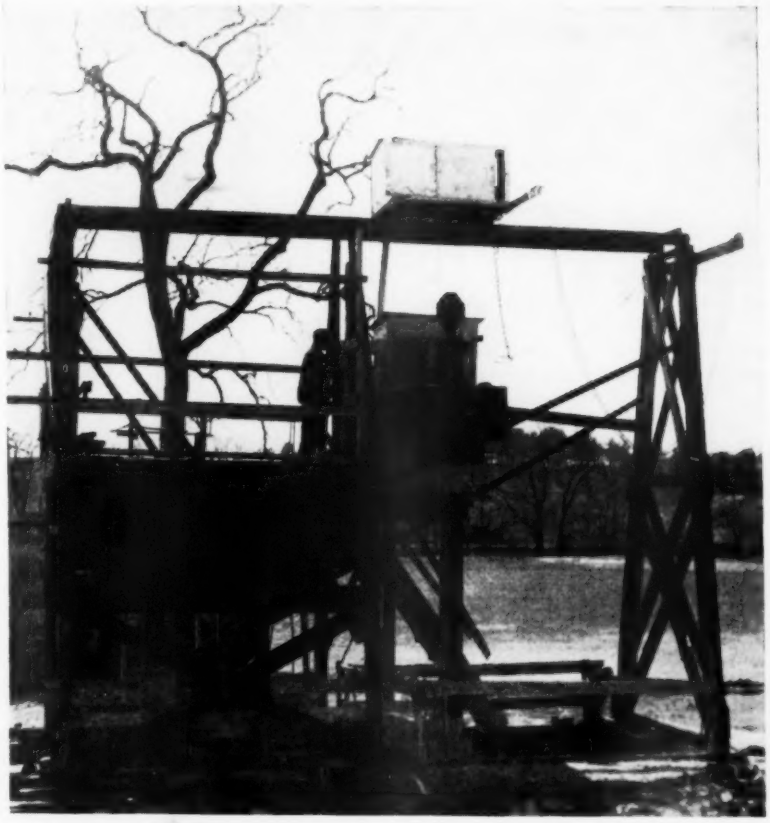
**L. T. BRUHNKE**
**Wauwatosa, Wisconsin**

WHILE the usual practice in the Milwaukee area of using a revolving crane at the shaft when tunneling for a sewer has been satisfactory, Walter Hoenecke of the Otto Seefeld Co. has developed an electric crane that lowered investment cost, eliminated the signal man and reduced maintenance, street area required and waiting time. In most tunnel jobs, the muck is brought to the shaft in a small car, and hoisted to the surface by the crane, which also lowers the empty car. In large tunnels, turnouts are provided to permit cars to pass each other between the face of the tunnel and the shaft. On busy streets, the crane requires a lot of room and overhead electric wires may complicate its operation.

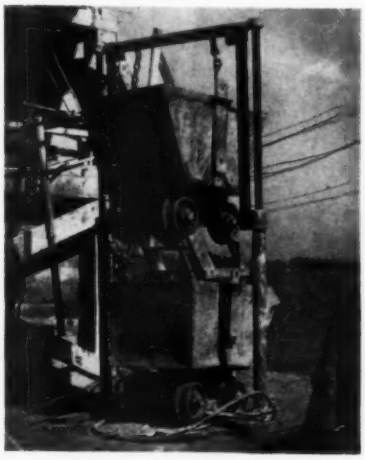
The Hoenecke electric crane is mounted directly over the mouth of the shaft, by means of a frame or similar device. The operator can look down the shaft and gauge the speed and location of the crane hook, thus eliminating the signal man. The crane is powered with a 10-hp motor for lifting and a ¾-hp motor for travel. Hook speed is about the same as that of the standard crane.

Operation is as follows: After the car has been emptied, it is lowered down the shaft to within about 6 feet of the tracks. The full car from the tunnel face is pushed under and beyond the suspended empty, which is then lowered to the tracks and moved toward the working face. After hooking to the full car, the empty can start back into the tunnel.

When the tunnel is a long one and not wide enough for turnouts or switches, time may be lost due to waiting for the car to return from the shaft. Hoenecke devised an air-operated lift, which is in effect a vertical turnout. The empty car is brought to the hoist and raised to the top of the tunnel; the full car is pushed under the empty and to the shaft; the empty is then lowered and moved to the face of the tunnel. The process is repeated, as necessary.



● ***ELECTRIC CRANE** set up over shaft of sewer tunnel, showing (1) A-frame supports; (2) control cab which permits operator to see down the shaft; (3) car being emptied; (4) bin for holding muck.*



The electric crane shown in the illustration is set up on a golf course where there is plenty of room; however, it has previously been used on a restricted street location for several months. Electrical connections are rarely a problem; and the electric crane is quiet.

It is estimated that an electric crane of this type can be built for about $1,500. No estimate on the cost of the tunnel hoist has been made. This is shown set up outside the tunnel for purposes of illustration.

***AIR-OPERATED** lift, set up outside tunnel, shows how loaded and empty cars can pass in a tunnel too narrow for switches.*

# ERRATIC BEHAVIOR OF PILING

**R. M. BROWN**

**Resident Engineer, Lake County Hwy. Dept.**
**Waukegan, Illinois**

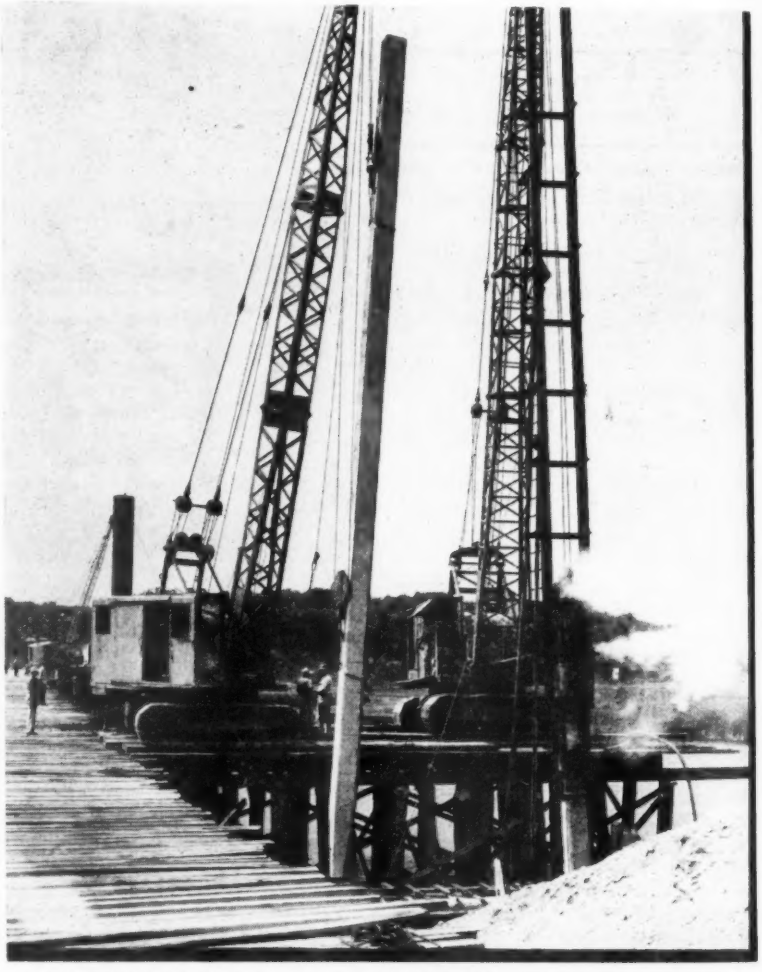
BORINGS at the site of the Grass Lake Narrows bridge over the Fox River channel in Lake County, Ill., indicated 1 to 5 ft. of water; 4 to 12 feet of gray muck; 40 to 63 ft. of gray clay and sand; and a hard packed fine gray sand underneath. In the gray clay and sand, the clay predominated in the upper layers and the sand in the lower layers. The hard packed fine sand was found at depths of 62 to 81 ft. below water level. The erratic behavior of piling driven in these formations was one of the most interesting features of the job.

The bridge is being constructed near the Village of Fox Lake, and is a joint project of Lake County, the State of Illinois, and the Federal Government. At the point where the bridge is located, Fox River is a part of Grass Lake, which here is only 900 ft. wide. Normal water elevation, maintained by a dam at McHenry, several miles south of the bridge, is 736.7, but is varied by control works to about 735.2 in the winter, though the water rises as high as 740.7 in exceptional spring floods.

### *Details of the Bridge*

The bridge is an I-beam and plate girder structure with two 100-ft. clear (106 ft. 3 ins. overall) channel spans; two 55-ft. approach spans on the east; and three approach spans on the west. Two of these are 50 ft. 6 ins. and one is 64 ft. 9 ins. The total back-to-back of abutment length is 495 ft. 11 ins. The remaining 400 ft. of open water is spanned by aproach fills containing 42,000 cu. yds. of borrow. These were built in the fall and winter of 1947 by the Eric Bolander Construction Co. of Libertyville, Ill.

Piers are supported on pile bents consisting of 16 to 35 reinforced concrete piles 18 ins. square and averaging about 55 feet long. These extend 6 ft. into the piers. Required pile bearing varied from 25 to 34 tons per pile; however, a much greater bearing value was obtained in driving the pile to the minimum



● ***TEMPORARY timber tramway at left. Reinforced concrete pile 55 ft. long is being placed for driving.***

penetration considered necessary to prevent lateral movement. The Vulcan No. 0 single acting steam hammer, with a rated striking energy of 24,375 ft.-lbs., was none too large. The test pile for pier 6, typical of the first pile driven in each bent, penetrated 18 feet under its own weight, reached the required bearing with a penetration of 0.5 inch per blow at 27 feet, tightened up to a penetration of 0.35 inch per blow at 32 feet, then steadily lost bearing to a penetration of 0.75 inch per blow at 52 feet, then quickly tightened up again to a penetration of 0.01 inch per blow at 60 feet. The remaining piling in each bent followed a similar pattern, with each succeeding pile becoming harder to drive with the exception of a few strays which barely reached required bearing at full length. In general the bearing value of the piling was erratic and unpredictable in the zone of mixed clay and sand but quickly approached refusal with a short penetration into the layer of hard packed fine sand.

Practically all work on the substructure was done from a temporary timber tramway built just to the south of the permanent bridge site. The tramway, about 585 feet long and 15 feet wide, with 9½-ft. clearance, consists of timber piling

# IN MIXED SAND AND CLAY FORMATION

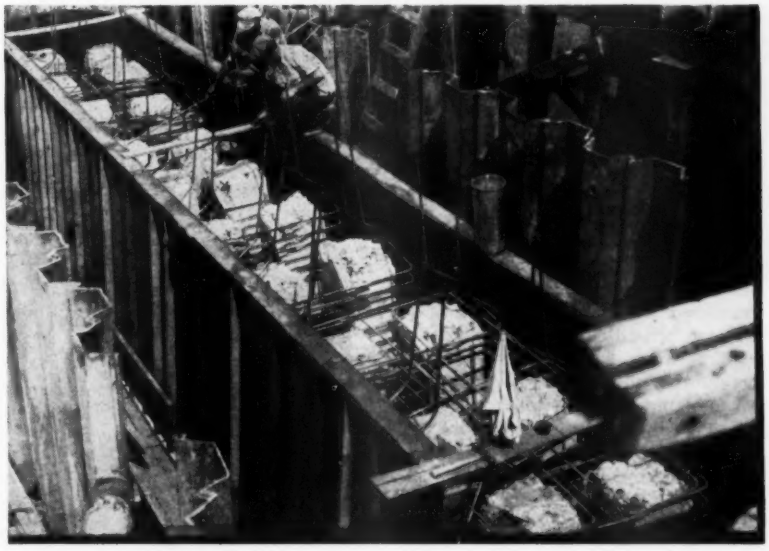
from 40 to 55 feet long, with pile bents on 16-ft. centers, 12″ x 12″ caps, 8″ x 16″ stringers, and a 3-inch plank floor.

### The Abutments

The concrete pile bents are capped 18 inches below normal water level with solid reinforced concrete piers 6 to 7 feet wide at the bottom and 2′ 6″ to 4′ wide at the bearing plates. Average height of pier is 15 feet. Piers were poured in two lifts inside a steel sheet piling coffer dam, with the water pumped down to a level below pier bottom, and with the bottom form supported on timber piling which was left in place. Abutment bents are capped just below bridge seat level with 2′ 10″ x 3′ 7″ reinforced concrete caps poured integral with combination end posts and short wings. The fill slopes will be protected with riprap.

The deck will be a 6½″ and 7″ reinforced concrete slab, with a 24-ft. roadway and 3-ft. sidewalks on each side, and will be entirely on a 680-ft. vertical curve connecting the two 4 per cent grades necessary to obtain the required 14-ft. vertical clearance. Rails will consist of 6″ x 6″ stanchion posts with a 6″ ship channel bottom rail and a built up angle iron top rail.

The short spans will be 24″ and 27″ I-beams and the two long spans will have plate girders with a 54″ x ⅜″ web and a maximum 74′ 10″ between field splices. Abutments will have roller bearings, with bearing plates at piers 1, 4 and 6, rockers at pier 2, and rollers at piers 3 and 5.

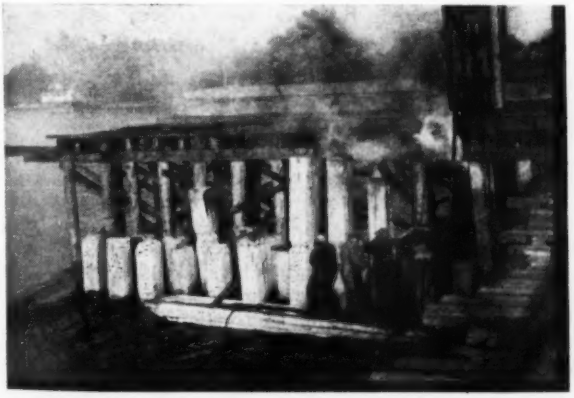


● ***STEEL SETTERS work out a puzzle in reinforcement. Steel piling and forms are in place around the concrete piling, and pouring of the pier will soon start.***

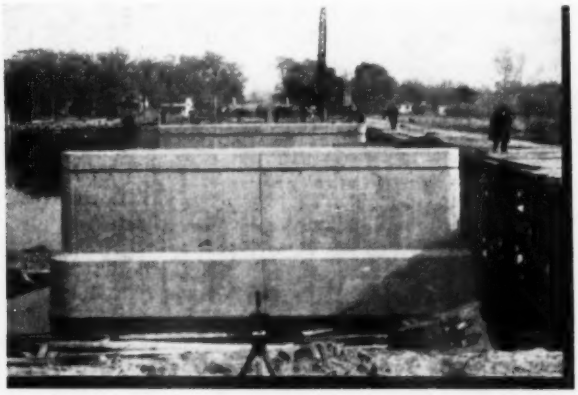
Among the major pieces of equipment used were 4 Koehring cranes of ¾ to 1¾-yard capacity, 1 Koehring 27-E Mixer, 1 Caterpillar D-4 end loader, 40-ton Johnson bins and scales, and 2 Vulcan Steam hammers, No. 0 and No. 2.

Progress to date has been quite satisfactory with due allowance for difficulty in obtaining material deliveries.

Bridge design was by A. Benesch and Associates of Chicago. Construction is by the Shappert Engineering Company of Belvidere, Illinois, with Superintendent Max Summers in charge. The writer, R. M. Brown, is Resident Engineer, representing R. M. Lobdell, County Superintendent of Highways of Lake County, Illinois, R. T. Cash, District Engineer for the Illinois Division of Highways and F. M. Johnson, District Engineer for the Public Roads Administration. The American Bridge Company has the contract for furnishing structural steel.



● ***JACKHAMMER and torch crew makes cut-offs as pile-driving crew continue sinking the piles.***



● ***PIERS are in place, ready to erect the steel. This view is on the centerline west to east.***

# RIVER, RAILWAY, HIGHWAY

# *Complicate Sewer Construction*

**D. C. WESCHE**

**City Engineer, Manhattan, Kansas**

LIKE most small cities, Manhattan has had growing pains within the past decade. This growth can be attributed mainly to two factors—the nearness of Ft. Riley and the increased enrollment of Kansas State College, which is located in this city.

Our sewer system was installed originally in 1911, and the only enlargement has been due to the extension and addition of laterals. Consequently, the main line interceptor became overloaded. We have no sewage treatment for our 20,000 population, and the sewage is discharged directly into the Kansas River. During high water periods, pumping is necessary, as the river elevation rises above the sewer system flow line.

The main sewer outfall is a 24-inch vitrified clay line which intercepts various mains, submains and laterals. As already stated, this was overloaded, and it was deemed necessary to construct a relief to this line; and also to provide a new sewer to take care of the flow from Kansas State College, which was overloading the 8-inch line serving it.

The two projects were combined into one. A 21-inch vitrified sewer along the river was designed to be connected with an 18-inch overflow line from the existing outfall; and a new 18-inch line, part vitrified clay and part corrugated metal, was continued from the relief line back to the college. The new sewer discharged into the old outfall at the pumping station. The sketch herewith shows the layout. A is the site of the pumping station; from A to B, a 21-inch VC line was constructed; at B an 18-inch relief was extended to D, where it intersected the old 21-inch line. From B to C, an 18-inch corrugated metal pipe was used; and from C to E an 18-inch VC pipe.

● ***18-INCH VITRIFIED clay sewer under construction. The 36-inch wide trench is being cut with Parsons trencher shown at rear which was able to pass between the two rows of trees.***

### *Construction Problems*

The first contract included the installation of the 21-inch vitrified clay pipe from A to B, and the 18-inch vitrified clay pipe from B to D. Numerous problems confronted us. First, the excavation was 12 to 18 feet deep. Second, because of the nearness of the river and the old river channel, we found the soil to be very sandy. Because of this sand, a flat slope had to be provided on the ditch to be sure that the banks did not cave and endanger the lives of the men, crush the sewer, or cause misalinement of the sewer. Third, we had to go under the main line of the Union Pacific Railroad and cross Federal Highways Nos. 40 and 24. However, the contractor completed this work without incident or interruption to traffic on either the railroad or the highway.

The excavation was done with a drag line, which proved to be very efficient in this case. That part under the railroad tracks was cast iron pipe threaded through a 30-inch corrugated metal pipe that was jacked into place.

The contractor was prepared to use a well point system to de-water the ground if necessary, but the river elevation was low and the grade was above the ground water in all cases, permitting much faster work and a

better job because of the dry trench.

The grade was very flat, being only 0.12% on that part of the project from A to B to D. It was a major problem for the engineering staff to be sure that the finished sewer was properly graded and alined.

### *Work on the Second Project*

The second project started at B and continued through E. The entire project consisted of 18-inch vitrified clay pipe, except that we used corrugated metal pipe, asphalt coated and bonded, from B to C. We chose to use this type of pipe because the subgrade was an old river channel and there were no connections required directly to this line. By using 20-foot lengths, it was possible to lay it very fast, thus cutting the time that the back water in the old river channel might threaten. It was also easy to adhere to the grade, because of the additional bearing of the longer lengths. We found the cost of the corrugated metal pipe and the vitrified clay pipe to be about the same.

From point C to E, the sewer was located in the north parking of Bluemont Ave. and the line was between 2 rows of trees. It was necessary to remove only 2 trees in the entire 10 blocks on Bluemont Ave. However, there were numerous problems that did arise in proceeding through town. There were water mains, electric cables, storm sewers, and about 70 house water services. The contractor gave special attention to these, and dug each out by hand ahead of the digger. The trench was 36 inches wide and was dug with a Parsons Trencher, which was able to go between the rows of trees.

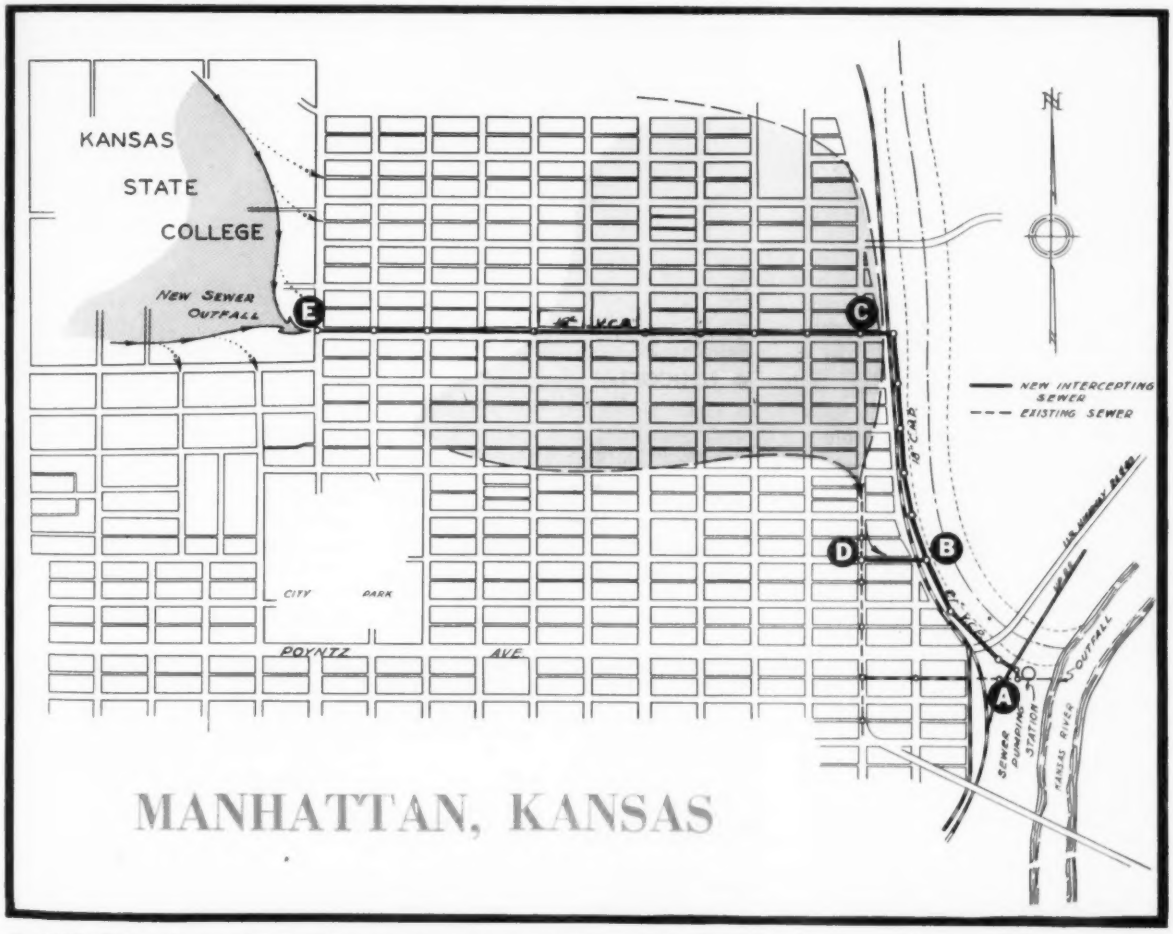
The jointing compound used with all vitrified clay pipe was a cold asphalt jointing material, Kalktite. We found it to be easy to use. It was pliable and flexible, and we feel it will give us a better joint than a mortar joint. In all cases, we calked the joint with jute prior to using the jointing compound.

***Many communities have problems of overloaded or inadequate sewers. This article tells how one city, despite difficult construction conditions, has made provisions for its probable needs for the next 15 or 20 years at a reasonable cost.***

The total cost of the project, including both contracts, was $77,500. The total length of the two projects was 8,607 feet. The cost per foot was $9, which we feel was reasonable.

With this new intercepting sewer in operation, our system in this area should be adequate for the next 15 to 20 years.

This job was a pleasure to install, for both contractors were very cooperative and realized the importance and necessity of doing the work properly.




● ***THIS MAP shows the location of the sewers that were constructed, the proximity of the river, and railroad and highway crossings. A relief sewer was extended to serve Kansas State College, upper left.***

# INSECT CONTROL

## *With Mechanical Equipment*

ARNOLD M. LIVINGSTON

EFFECTIVE insect control has made great strides due to the recent development of more powerful chemicals and more efficient methods of dispersion. Interest by the public in this problem has caused many communities to become "bug conscious," and the past five years has seen a marked change in the thinking of civil officials charged with the welfare and health of the people in their community.

The development of new insecticides such as DDT, DDD, Methoxychlor, Chlordane, synergized pyrethrum extracts, Benzene Hexachloride, Parathion and Toxaphane created the need for applicator manufacturers to design equipment which will utilize these new chemicals most efficiently. Each insecticide and applicator is a tool which, when properly used, will serve one or more specific functions, but no one toxicant or type of equipment will control every insect and do every job. Realization of this fact will permit public officials to carry out insect control programs in an economic and effective manner. The preparation for local programs involves a thorough consideration of both insecticides and equipment.

### *Types of Equipment Available*

**Helicopter—Fog:** This unit, manufactured by Bell Aircraft Corp., is designed for large scale operations. Its ability to cover large areas rapidly and at a low cost makes it particularly suitable for outdoor operations over mountainous or woody terrain. The present unit has a fog head attached to the engine exhaust allowing the heat of the exhaust gasses to aid in the combustion and atomization of the insecticide into a dense fog. This fog is forced downwards at 26 miles per hour (1,400,000 cubic feet of air per minute traveling 10 to 15 miles per hour) by the strong downwash or pressure of the revolving propellers. Swath coverage extends 150 to 300 feet on each side of the helicopter. The capacity of the insecticide storage tanks is 40 gallons, which is sufficient for approximately 60 minutes of air operation.

● ***HELICOPTER "fogging" a brushy area. The DDT fog penetrates into the foliage, resulting in a high percentage of kill.***

The fog penetrates into dense foliage, ravines, and other areas that must be reached and covered by the insecticide to destroy all insects. The consumption of insecticide per unit of time is low and by using a highly concentrated product, the helicopter can remain aloft for long periods. Special fog oils are available which serve as excellent solvents for certain insecticides. One in particular forms a heavy fog which clings to the ground or area fogged. Since the fog does not readily dissipate, there is ample time for the deposition of a sufficient amount of insecticide on exposed surfaces.

While the initial outlay for the helicopter is high, its overall, long-range cost will be inexpensive. Less expensive models will be in production in the near future. Upkeep and other expenses are moderate. Figures on operational cost for northern New York State, in 1948, are as follows: An area of 4,000 acres were fogged three times by helicopter, using ¼ pound of DDT Technical per acre or the equivalent of 15% DDT (½ pint of liquid formulation per acre). Ef-

● ***MIST BLOWERS are used effectively with water base insecticides for mosquito and fly control and for orchard treatment.***

fective swath width was 150 to 300 ft. An average of 1,203 acres per day was fogged, with a total fogging time of 68 hours. The helicopter covered 178 acres per hour. The cost of operation of the unit per hour of flight was $35 to $40.

With a helicopter, the crew required for field operations will consist of one truck driver to haul supplies to specified areas and the helicopter pilot. This does not include preparation of the insecticide.

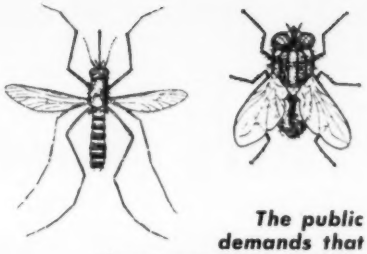
### Mist Blowers

Mist blowers are manufactured by Lawrence Aeromist Co. In this, a centrifugal pump forces air through a small orifice causing internal turbulence and high pressure. Air speeds are as high as 150 miles (8,000 cubic feet of air per minute at the end of the 10" exhaust tubes). Liquid insecticides are injected at the center of the end of the air stream tube, where they are broken into a finely dispersed mist. The powerful draft gives excellent coverage forcing insecticide mists to the tops of high trees and on a horizontal plane carrying them as far as several thousand feet.

Oil base insecticides have been used with some success but care must be exerted not to burn or kill plant foliage, trees, or vegetation by using heavier dosages of petroleum solvents than recommended by the machine manufacturer. To eliminate this danger, many operators are now applying water base insecticides which are just as effective in kill and have equal or better wetting ability and tenacity. This unit uses interchangeably oil or water base insecticides, wettable powders, and certain types of fungicides. Because it does not work on a thermal principle, there is little danger of the chemical breakdown of the ingredients dispersed. This is particularly important with reference to the use of pyrethrum, rotenone, Ryania and some fungicides.

Mist sprayers are useful in parks, in mosquito and fly control programs, and in orchard work. The larger units weigh approximately 1400 lbs. (smaller ones are now available) and can be mounted on the back of a ¾-ton truck (mounting space 5' 6" x 6'). The mist applicator thoroughly wets surfaces and it should not be used where a visible residue is objectionable. The particle size obtained with mist blowers is larger than that of fog units and accordingly for certain jobs which require deep penetrating ability, the mist blower is not always applicable. Its cost of operation is moderate. Data on costs of tree spraying in Syracuse, N. Y., follow: 40,000 trees were sprayed in 18 spraying days. Labor expense at $1 per hour totalled $576; operating cost was $5 per day or $90. In all 3,600 gallons of 6% DDT were used, or ¾ pint per tree; 0.9 man-minute per tree was required. Machine costs were $1,980.

The crew required is a driver for the truck and one operator for the unit. The capacity of the insecticide storage tank is 53 gallons and this is sufficient to spray approximately 424 trees 70 to 80 ft. high, or 53 acres.



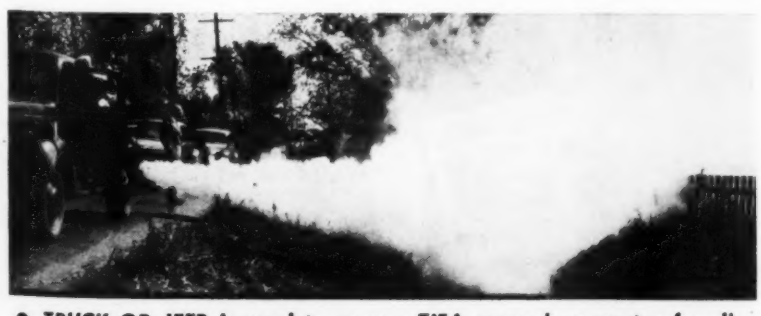
***The public demands that these pests be controlled.***

● ***AEROSOL GENERATORS are easily portable and permit adjustment of particle size from 0.5 to 200 microns as desired.***

### Aerosol Generators

TIFA is an aerosol generator manufactured by Todd Shipyards Corp. Such fog applicators have been used widely to disperse aerosol fogs for effective insect control at low cost. Oil is atomized in a fog chamber, then mixed with a small amount of concentrated insecticide and released through a special fog nozzle. Three years of field use have allowed time for improvements. The present model can be mounted on a jeep or ½-ton truck with ample room to store the daily insecticide requirements and accessory equipment. The particle size of the fog may vary from one half micron to 200 microns (wet spray) and is easily adjusted by a valve on the control board. Its ability to deliver clouds of fog over small lakes and into swamps and dense foliage, and its adaptability

*(Continued on page 72)*



● ***TRUCK OR JEEP is used to convey TIFA aerosol generator for dispersing fogs for insect control.***

# HOW
# to prevent Accidents on the JOB

★ *Safe practices and safety education in public works construction—what to do and how to do it* ★

## SAFETY
## in Water Main Construction

**These data are from a paper before the 1948 Safety Congress by Wendell R. La Due, Superintendent and Chief Engineer, Bureau of Water and Sewerage, Akron, Ohio.**

WHAT items constitute the safety or accident prevention problems in water main construction? For the sake of clarity we will outline first only the physical hazards and processes:

**A. Excavation:**

1. Pavement breaking—flying chips; thrashing broken air hose.
2. Machine excavation—boom clearance; dropping of boom or bucket by mechanical weakness or tampering with controls.
3. Hand excavation—loosening boulders from side of trench; dropping them in removal from trench; running material, with possible cave-in.
4. Trench sheeting—inadequate or loose bracing and shoring.
5. Truck loading—faulty spotting; spilling of material during loading.

**B. Pipe Handling and Laying:**

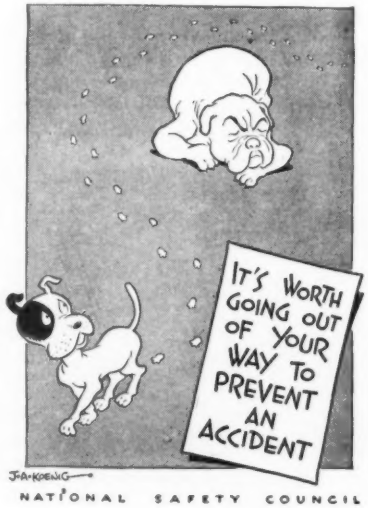
1. Loading, storing and unloading pipe—unsafe slings and hooks; inadequate blocking permitting rolling on truck; in storage or along the street.
2. Lowering pipe — unsafe slings and frame; inadequate grip when using machine for lowering pipe; improper signalling.
3. Laying pipe—carelessness in centering pipe and placing blocking; cramped quarters; improper cutting technique.
4. Jointing—careless handling of hot material, top trench side and at joint; insufficient care in pouring "wet" joints.

**C. Backfilling:**

1. Unloading trucks—faulty spotting and faulty dumping; Lack of inspection of material.
2. Tamping—danger in working around pipe.
3. Removal and cutting of sheeting—danger from running sand and loosened boulders; dull axes.

**D. Barricades and Lights:**

1. Inadequate lights and barricades of open trenches; Faulty temporary surfacing.
2. Inadequate lighting on trucks, especially during emergency operations.




### *Safety for the Worker*

In all the above one thing seems to stand out—familiarity with a repetitive job, its tools, its materials, and its processes, leads to contempt for known sources of danger and thus to consequent accidents. Here are a few Akron observations:

1. Emergency trucks should be equipped with warning lights on both front and rear. These should be at normal heights installed to blink continuously while on the job.
2. For handling pipe use cable and hooks. A frayed cable may be seen while a weakened link in a chain sling will pass unnoticed. Periodic tests should be made.
3. Accidents, regrettable as they may be, can be great teachers to the workmen.
4. Cooperation with men employed by other utilities pays dividends in our organization. They are very willing to protect their poles, pipes and conduits if given the opportunity, thus relieving our safety program to that extent.

### *Safety for the Public*

We cannot consider safety with full regard to the utility workers only. What of the public? We say casually that they are protected by barricades and lights and by safe operation of equipment on the public street. But what of provision for their protection from potential dangers surrounding various water works structures?

Nearly all water utilities have elevated storage tanks, reservoirs and electric pumping stations located within the city. These are often near recreational or playground sites. What of a safety program tailored to apply to those using this area—especially to children? Special reference is made to such items as:

1. Tank towers—in spite of all normal protection, teen-agers will climb the towers to paint high

*(Continued on page 76)*

## *"One picture is worth 10,000 words"*

# SAFETY POSTERS

***Are you selling safety to your employees? Here are some ideas on the use of those potent sales tools, safety posters, which can effectively cut down lost time on the job and avoid accidents that may result in serious personal injury, delay, and damage to equipment.***

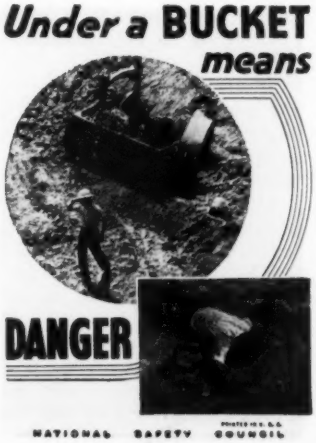
SAFE working habits must be sold to employees of municipalities and counties in the same way that safety is sold to industrial workers. The worth of the safety poster for this job has been demonstrated so often that there can be no question about its value. Invariably it proves an effective medium for attracting the employees' attention and getting across a safety message that will stick

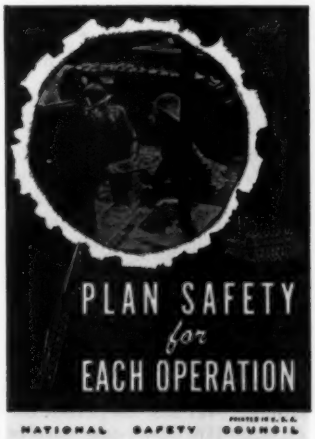
For 35 years the National Safety Council has been publishing posters designed to train workers in the safe way of doing a job. The Council's recently published "1949 Directory of Occupational Safety Posters" reproduces a total of 744 black-and-white and four-color posters. Subject matter covers every phase of construction and materials handling plus miscellaneous thought-provoking messages ranging from the hazards of dull tools to poison ivy.

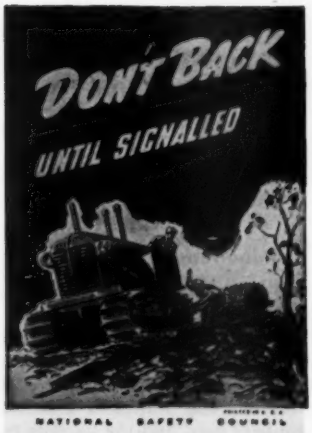
Besides showing the variety of posters available the Directory outlines briefly a few general rules for using posters effectively. You know the unsafe habits to be corrected—select posters objectively, using a balanced supply of thought-provoking vs. humorous messages. Place posters strategically so that long messages appear where workers linger and short "flash" types where traffic keeps moving. Make an attractive display of posters on bulletin boards or in frames, and finally, change posters frequently so that constant variety will attract attention.

To get a copy of this helpful Directory write the National Safety Council, 20 N. Wacker Drive, Chicago 6, Ill. Copies are 50¢ each.

Start planning your poster program well in advance and let your accident record be your guide.





# SEWER CONSTRUCTION SAFETY Can Pay Dividends

**Portions of a paper before the 1948 National Safety Congress by Eugene A. Schmidt, Ass't Construction Engineer, Department of Public Works, Milwaukee, Wisc.**

SEWER construction in its various phases is generally recognized as an extremely hazardous occupation. When it is considered that rates for workman's compensation insurance for this industry are second only to those charged for wrecking operations and that, for every dollar of labor used, as much as fifteen cents must be added to cover the cost of such insurance, it will readily be seen that this industry is a fertile field for accident prevention measures.

Sewer construction is divided roughly into five major phases. These in the order of increasing hazard are (1) earth open-cut, (2) rock open-cut, (3) non-pneumatic earth tunneling, (4) pneumatic earth tunneling, and (5) rock tunneling.

The Industrial Commission of Wisconsin has promulgated "General Orders on Tunnel, Caisson and trench construction." These are the result of the work of a committee composed of representatives of the Industrial Commission, labor, contractors, medicine, engineers, and insurance companies. They apply to all tunnels, caissons, accessory shafts and trenches while under construction with the exception of tunnel construction in connection with mines. They prescribe in an extremely comprehensive manner the minimum safety measures to protect workmen and the public against hazards from cave-in, fire, blasting, storage of explosives, use of equipment, improper sanitation and ventilation along with minimum medical requirements.

### *Requirements and Rates*

In open-cut work the minimum trench timbering requirements are prescribed under varying conditions such as, depth, width, type of ground and proximity of previous trenches. In tunnels the minimum dimensions of timbers used and the various types of timber sets and their limiting dimensions are prescribed. The constructor chooses the type of timbering set to suit the ground conditions and the dimensions of the finished sewer.

The types of timbering and the limitations described are the box type, modified box, hexagonal, arched 6-piece set, cap and leg type and the arched 5-piece set and some modifications thereof.

The 1948 insurance rates for sewer construction industry for four of the five general classifications of sewer work per $100 of payroll are, earth open-cut $5.75, rock open-cut, about $8.25, non-pneumatic tunneling $11.25, pneumatic tunneling $14.00. There is no established rate for rock-tunneling; each project is given a rate according to the conditions of the job.

These are base rates. The contractor has some individual control over these rates. After a contractor has been in business for five years or has paid a premium of $800 in any one year or $400 for two years he is qualified and is given a credit or debit rating depending on his safety record. If his record is above the average he receives a credit rating of a percentage of the base rate. Conversely if his record is below average.

Theoretically a contractor with a perfect record can get a credit rating of approximately 70% of base rates. Of the group of approximately fifteen contractors bidding on work in the City of Milwaukee, the spread is from a credit of 18 per cent to a debit of 4 per cent, with the majority being on the credit side.

The sponsor of sewer projects has a definite stake in safety. At the present time the City of Milwaukee is doing about two million dollars worth of sewer construction per year. A reduction of one dollar in the insurance rate would net us about ten thousand dollars, assuming labor as fifty per cent of the cost of a project.

The contractor very definitely will profit from increased safety. It is evident that the contractor with the highest insurance credit has a bidding advantage over his competitor on the debit side. His crews are more efficient and the safe contractor, other things being equal, usually has his pick of men.

***SAFE SHEETING is a first essential for safe trench construction. This illustration shows good practices.***

It has been my experience that the most successful contractor is the one who is most interested in the safety of his men. Likewise, the foreman who is careless will soon be so unpopular with his men that it will be difficult for him to hold his crew. At the present time men are independent because they know skilled help is at a premium and consequently they will not work under more adverse circumstances than prevail on other jobs.

I do not believe that any program of safety in the sewer construction industry can be successful without a comprehensive set of regulations. It cannot be self-regulated because of the uncertain nature of the industry. Most sewer contractors are gamblers to a certain extent. They must be, because it is difficult to foretell with any degree of certainty the nature of the soil conditions that may be encountered.

Because sewer contractors are gamblers when they bid a job they are all too prone to gamble on timbering, which may be adequate for the visible ground conditions but not allow for those that may be a few feet or inches away on either side. Therefore a set of regulations similar to Wisconsin's General Orders in indispensable in any safety program, and if a state or community does not have such a guide the first order of business should be to have one established, preferably on a state-wide basis.

# HANDLING AND STORING CLAY PIPE WITHOUT DAMAGE

USERS of vitrified clay pipe can save time, labor, and money in the unloading and storage of clay pipe by following simple procedures set forth below. Data on safety in handling pipe, methods of unloading cars and some procedures in loading pipe on trucks were published in Public Works for August, 1947.

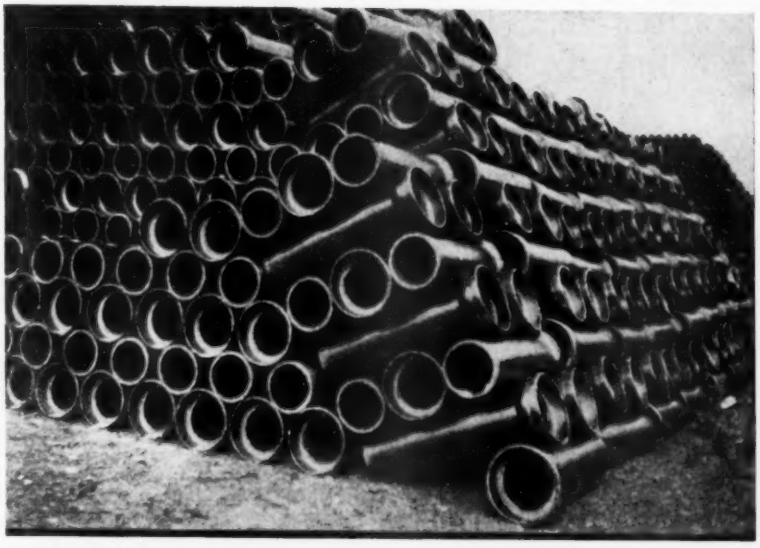
Observing these precautions in loading trucks from railroad cars will guard against possible shifting or dumping of the load, and will make the whole job of transportation easier, quicker, and safer.

1. In transferring pipe from car to truck, place the truck so that there is *no gap* between the truck platform and the car. Never allow the truck floor to rest on the freight car floor, for when the truck pulls away, sudden shifting of the load may damage the truck or dump the load.
2. Eight-inch and smaller pipe may be stacked on the truck bed in two or more tiers. Lay the first row of pipe with bells all the same way, blocking up the spigot ends with a 1" board. Reverse the next row, so that the bells face the other direction with pipe resting snugly in valleys of preceding row. This method of stacking pipe gives a tight-non-shifting load.
3. Pipe larger than eight-inch may be placed in a standing position on the truck bed. The larger pipe should also be placed bell-to-end, i.e., with the bell of one pipe resting on the floor of the truck, the bell of the other up.
4. Drive carefully, avoiding sudden stops and starts, and the pipe will ride perfectly over the roughest roads.

Vitrified clay pipe may be stored anywhere, inside or outside. The most adverse weather conditions will not affect it; but proper stacking results in a neat, tidy appearance, and saves time, both in storing and in drawing from the stack. Here's the recommended procedure:

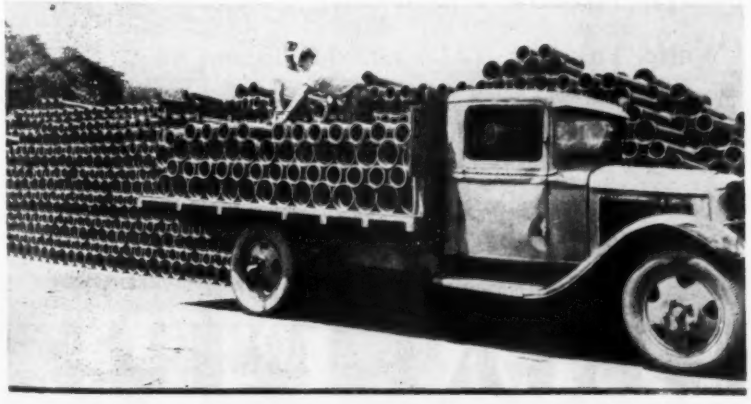
1. Stack all pipe up to 36" bell-to-end, lying down; 36" pipe is stored standing on bells.
2. Lay the pipe in rows on the floor or ground, blocking up both ends of each row with 2x4's to prevent pipe from freezing to the ground, or sinking into mud. Face all bells in one direction. Leave a space of about two feet between the last pipe on each end and the rest of the row. Then place two pipe at an angle over the last one in the row. These are placed crossways to the other pipe, with bell ends out, and resting over the end pipe. Spigot ends should be braced firmly against the row. The accompanying illustration shows correct method better than words can describe it. Reverse direction of bells of pipe in next tier. As the stack grows, keep building up the end-locks and the pile will stay neat, safe and secure.

Follow these rules and you'll find your loading, unloading, and storing time cut to a bare minimum. Pass this information along to your foreman and supervisors. Then, follow up to see that correct procedures are adhered to. It will pay you dividends.



● ***PIPE STACKED in this manner stays neat, safe and secure. Note how the end locks are built up to prevent movement.***

● ***LOAD large pipe bell-to-end.***



● ***LOAD small pipe in tiers on a truck, as shown in this view.***

# "Old Reliable" is again

When you can now get cast iron pipe—the "old reliable"—tried and true for generations—and can get it promptly—why buy anything else?

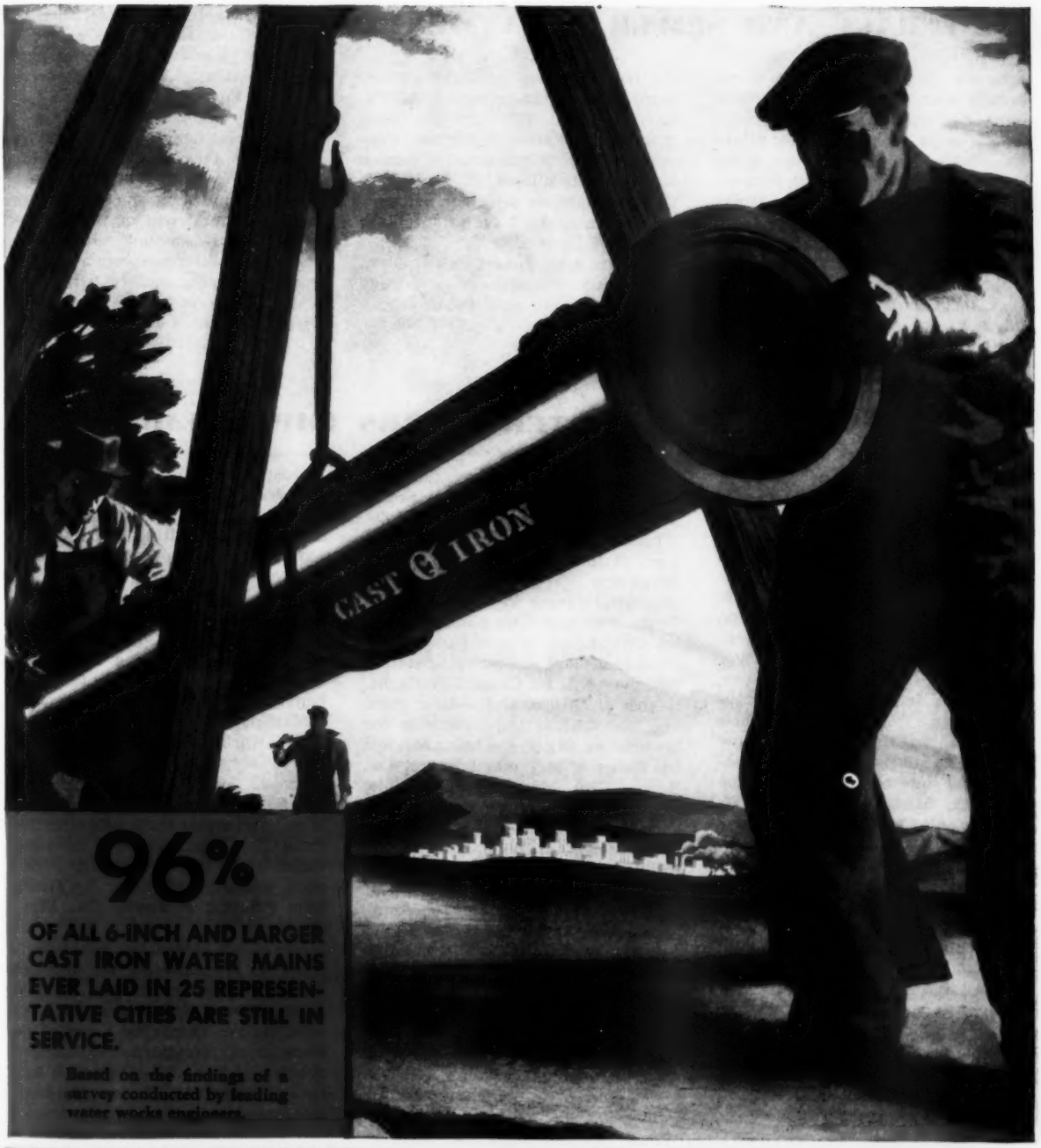
The qualities that enable cast iron pipe to serve for centuries are also the qualities that mean day-by-day economy in the operation of a water distribution system. *Qualities that result in low annual maintenance cost.* (Reports from 195 water works superintendents show that the maintenance cost of cast iron distribution mains is far below that of other pipe materials.) *Qualities that result in lowest cost per service year.* (96% of all 6-inch and larger cast iron water mains ever laid in 25 representative cities are still in service.)

With cast iron pipe, you save money on maintenance—you save money by fewer street-openings and repairs—you save money by avoided replacements which would be necessary with shorter-lived pipe. Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 122 South Michigan Ave., Chicago 3, Ill.

**CAST IRON PIPE**

*When you need special information—consult the* **READERS' SERVICE DEPT.** *on pages 85-89*

# promptly obtainable!


CAST IRON
96%
OF ALL 6-INCH AND LARGER CAST IRON WATER MAINS EVER LAID IN 25 REPRESENTATIVE CITIES ARE STILL IN SERVICE.
Based on the findings of a survey conducted by leading water works engineers.

# SERVES FOR CENTURIES

# Consulting Engineers Report

## *On Design and Construction*

## SEWERAGE AND SEWER TREATMENT:

Sewer lines and additions to the sewage treatment plant for Harrodsburg, Ky., and treatment works for the Jefferson Co., Ky., School Board are among the projects now being handled by **Howard K. Bell,** consulting engineer of Lexington, Ky. **Olney Borden,** Liberty, N. Y., opened bids in April for new sewer construction for the Village of Liberty to cost about $60,000. **Burns & McDonnell Engr. Co.,** Kansas City, Mo., is planning sewage treatment improvements for Petoskey, Mich. **M. E. Chamberlin,** Consulting Engr., Montevideo, Minn., is planning for enlargement of the Ortonville, Minn., sewage treatment plant.

**Chester Engrs.,** Pittsburgh, Pa., have completed plans for the West Sewage Treatment Plant at Williamsport, Pa., and for intercepting sewers and sewage treatment at West Newton, Pa., and at Beaver, Pa., and are about to complete the plans for an outfall sewer and pumping station for Greenville, Pa. **Dakota Engrg. Co.,** Mitchell, S. D., have let contracts for 1949 construction for sewer and water extensions at Gettysburg, sewers at Salem, and concrete paving at Avon, all in S. D. **Francis Engrg. Co.,** Saginaw, Mich., are now working on plans for sewage treatment and intercepting sewers for Bay City, Mich. **Gannett Fleming Corddry and Carpenter,** Harrisburg, Pa., are designing a sewage treatment plant for Huntingdon, Pa. A new sewage treatment plant is being designed for Angleton, Tex., **by Garrett Engrg. Co.,** Houston. **H. K. Gatley,** Maplewood, N. J., is studying the sludge disposal problems of Bridgeport, Conn, with a view toward vacuum filtration and sludge incineration.

**Clarke Gardner,** Consulting Engineer of Salisbury, Md., is preparing for bids on trunk sewer extensions at Seaford, Del., sanitary sewer extension and pumping station for the Maryland Tuberculosis Sanatorium at Salisbury, Md. and is also planning a 3 mgd sewage treatment plant for Salisbury, Md.

**Koch & Fowler, Engrs.,** Dallas, Tex., recently called for bids on an outfall sewer and treatment plant for Irving, Tex. Sewers and a treatment plant for Colonial Heights, Va., to cost about $200,000, are being planned by **Warren C. Perrow,** Consulting Engr., Richmond, Va. **Damon Runyan,** Consultant of Longmont, Colo., is planning sewerage and sewage treatment for Cortez, Colo. Work will start this spring.

**Roberts & Merriman,** Pampa, Tex., have under construction a sewage treatment plant and water supply improvements, totalling $500,000, for Pampa. Sewers, lift stations, sewage treatment, and water works improvements for Winter Haven, Fla., are being planned by **Russell & Axon,** Daytona Beach; also sewerage and sewage treatment for Bartow, Fla. **Robert L. Streeter, Casper,** Wyo., is planning sewage treatment facilities for four state-owned institutions at Thermopolis, Worland, Sheridan and Buffalo. He is also preparing plans for a sewage treatment plant for Wheatland, Wyo. The **Marvin Turner Engrs.,** Austin, Tex., are about to begin construction on a sewage treatment plant for Taylor, Tex., and they are also planning water works improvements at Eagle Lake, Lampasas, Luling and Georgetown; the total cost of these water projects will amount to $265,000. Sanitary and storm sewers and water mains are being constructed for Biwabik, Minn , under the direction of **Virginia Engrg. Co.,** Virginia, Minn.

## WATER WORKS IMPROVEMENTS:

**Howard K Bell,** Lexington, Ky., is planning water works improvements for Nicholasville ($100,000), Whitesburg ($50,000), Asbury College, Wilmore ($150,000), and the Kentucky Water Service Co. (12 properties); and at Johnson City, Tenn. A 60-mgd filter plant for Kansas City, Kans., to cost $2,600,000; a treatment plant and pumping station improvements for Council Bluffs, Ia., to cost $1,700,000; and a filter plant and distribution improvements for Menominee, Mich., are being handled by **Burns & McDonnell Engrg. Co.,** Kansas City, Mo. **Charles W. Cole,** So. Bend, Ind., is preparing for bids on a very large water improvement project for South Bend, Ind. **Ackley, Bradley & Day,** Sewickley, Pa., are handling some eleven swimming pool projects in many parts of the country. **Adams & Ells,** El Monte, Calif., will start construction soon on water works improvements for El Monte to cost $150,000. **Gannett Fleming Corddry and Carpenter,** Harrisburg, Pa., have projects for the Norristown Water Co. and the Borough of Waynesboro, Pa.

An elevated tank, pumping equipment and water main extensions for Lewes, Del. and filtration, coagulation and settling water treatment facilities at Pocomoke City, Md. are being planned by **Clarke Gardner,** Salisbury, Md.

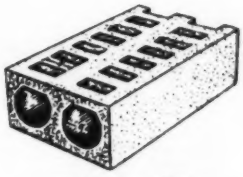
**Howard E. Bailey,** Consulting Engr., Boston, Mass., is engineer for Bristol, N. H., on water extensions to cost $75,000. Plans for three fill-and-draw pools for the city of Cincinnati have been prepared by **Wayne A. Becker,** Consulting Engr., Cincinnati, O. **Blackburn Engrg. Co.,** Pueblo, Colo., will soon make a report and recommendations for a municipal water system for Florence, Colo. **Floyd G. Browne,** Consulting Engr., Marion, O., is handling a program of water works extensions for Steubenville, O. **Couch & Kulin, Inc.,** Indianapolis, Ind., are designing a water works system for Mulberry, Ind. Water and sewer extensions for Wabasha, Minn., are being designed by **Davy Engrg. Co.,** La Crosse, Wisc.; also water main extension for Cuba City, Wisc. Bids for a complete water system for Otisville, Wisc., were recently called for by **Gould Blue Printing & Engrg. Co.,** Flint, Mich.

**Johnson & Depp,** of Owensboro, Ky., has let contracts for a water works system for Edmonton, Ky. **Jones, Henry & Schoonmaker,** Toledo, O., are preparing a report on water supply, treatment and distribution for Ironton, O. **Lockwood & Andrews,** Consulting Engrs., Houston, are supervising the construction of two pumping stations for Houston.

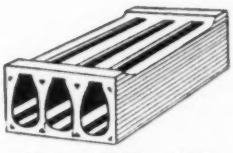
**Snyder, Wofford & McLellan,** Hillsboro, Ind., are handling water works improvements at Van Buren, Scottsburg, and Lagro, Ind., totalling $475,000. **A. E. Stilson & Associates,** Columbus, O., will soon take bids on

*(Continued on page 64)*

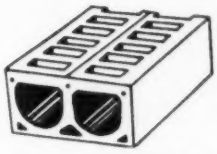
# TODAY'S FILTER PLANTS use *vitrified clay filter bottom blocks*



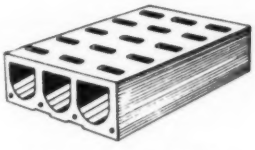
16" Armcre Filter Floor System



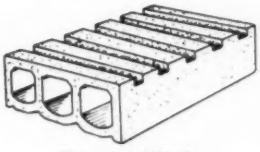
Natco Unifilter Tile



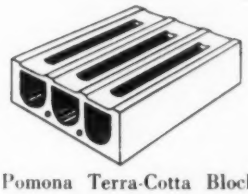
14" Armcre Block by Bowerston



Dickey Filter Block



Translot Block by Texas



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For better results from trickling filters, specify these *vitrified clay filter bottom blocks* proved in hundreds of installations.

## Super-smooth, non-clogging channels save trouble in trickling filters later

Solids cannot cling to the mirror-smooth channels in the *Vitrified Clay Filter Bottom Blocks* made by members of the Trickling Filter Floor Institute. Each block is provided with the entire inner surface super-smooth to give the finest operating results. Large openings in the tops allow air to circulate freely while carrying the sewage out. They help maintain aerobic conditions at all times. These blocks are easy to lay, too, even with unskilled labor. They are self-aligning and easy to work on after laying. These are specially designed, finest quality blocks made with standard fittings for use in any type or shape trickling filter. For lifetime, trouble-free service—and best results—always specify *Vitrified Clay Filter Bottom Blocks*.

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- LAST A LIFETIME

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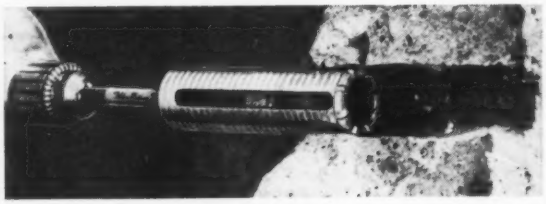
POMONA TERRA-COTTA CO. Pomona, N. C.

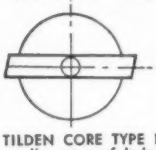
**DRILL CONCRETE**

**2 TO 6 INCHES PER MINUTE!**



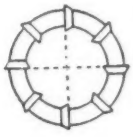
**WITH THE REVOLUTIONARY TILDEN ROTARY CONCRETE CORE DRILL BIT (driven by ordinary electric drill)**

Up to 70% more efficient than pointed or solid drills. Leaves straighter, cleaner holes. Tilden Rotary Concrete Drill Bits are available in sizes from ¼" to 4" diameter. Quotations on sizes from 4" to 8" will be made upon request.



Ordinary pointed or solid drill (left) must drill *full* area of hole. Point of drill acts as pivot and retards cutting. Only one double cutter gives slow action. Slow-moving ⅛" center travels at only 13% of most efficient cutting speed.

TILDEN CORE TYPE DRILL (right) drills much smaller area of hole. Has no point to retard cutting. All drills have from 3 to 24 cutters, depending on size of drill which travel at best cutting speed, give fast, efficient action.



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# CITY-COUNTY *Public Works* ENGINEERING DATA

## Bid Prices on Sewer Construction

Bids were received April 11, 1949, by the Village of Woodridge, N. Y., Olney Borden, consulting engineer, Liberty, N. Y., for constructing sewers and manholes. Items 1, 2 and 3 include furnishing and laying 8-inch vitrified clay pipe, trenching and backfilling. The engineer's estimate and the bid prices were as shown below. Bidders are listed in order on the basis of total bid for all work.

| | *Item #1 Depth to 6 ft. 1955 ft.* | *Item #2 Depth 6' to 10' 212 ft.* | *Item #3 Depth 10' to 14' 331 ft.* |
|---|---|---|---|
| **Estimate** | **$2.20** | **$3.00** | **$6.00** |
| **Low Bid** | **2.55** | **3.50** | **3.60** |
| **Second** | **2.15** | **2.85** | **4.45** |
| **Third** | **3.00** | **4.80** | **5.50** |
| **Fourth** | **2.30** | **2.80** | **6.00** |
| **Fifth** | **3.10** | **4.20** | **6.60** |

Item No. 4 including jacking 90 ft. of 36-inch reinforced concrete pipe through a railroad fill 17 ft. deep, and laying an 8-inch cast iron sewer through the concrete pipe. The engineer's estimate was $40 per ft., or $3,600 total. Low bid was $20 per ft.; other bids, in the above order, were $30, $31.50, $35 and $45 per ft.

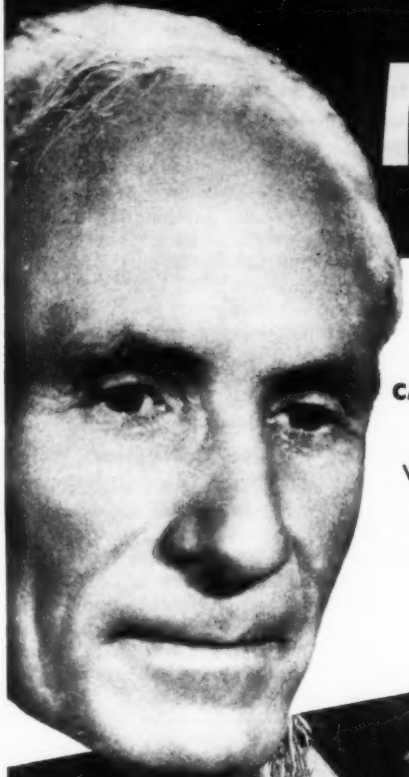
Item No. 5 included construction of 13 brick manholes, average depth 6 ft., complete with standard cast iron manhole frames and covers. Engineer's estimate was $200 each; low bid was $190.50; other bids, in above order, were $200, $140, $225 and $310 each.

## Good Practice in Disinfecting and Flushing Water Mains

Proper flushing and disinfection of water mains has been the subject of much study by the Honolulu Water Department during the past two or three years. A minimum velocity of 7 ft. per second has been established for flushing new mains, and all new mains have been designed with washouts and other facilities to attain this velocity. New mains are chlorinated with approximately 100 ppm of chlorine for 24 to 48 hours after flushing, and are placed in service when a bacteriologically safe water is obtained. The maintenance crew assigned to this work is equipped with portable gas chlorinators, hypochlorinators, high-pressure pumps and flow measuring equipment.

Care is taken to prevent introduction of contami-

# "From then on, we bought McCULLOCHS"

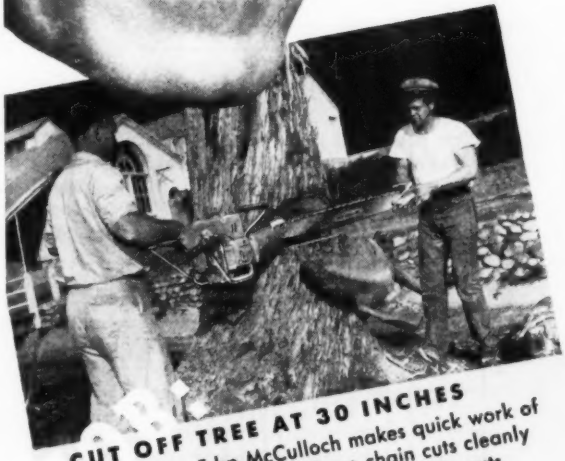


McCULLOCH McC CHAIN SAWS

## *Ralph C. Puckett*

**CALIFORNIA TREE SERVICE, Los Angeles, says**

"We really gave our first McCulloch chain saw a work-out. We tested it on big trees, little trees, branches, hard wood, soft wood, palm, roots, knots, and angle cuts. We found the McCulloch cut faster, was easier to use and carry, and saved money on sharpening. From then on, we bought McCullochs. We now have ten more like the first, and they're all the best saws we've ever used."



**CUT OFF TREE AT 30 INCHES**

The 5-hp McCulloch makes quick work of big trees. The Rip-Cross chain cuts cleanly in any direction—saves time on angle cuts and roots, as well as crosscut or rip.

**LIMB AND BUCK FELLED TREE**

Light weight (49 lb. as shown) and good design make McCullochs easy to handle, save muscles and time. Another time-saver on the job is easy sharpening and no setting of chain teeth.

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60-inch Chain Saw..$425.00

20-inch Bow Saw...$425.00

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**FOR**
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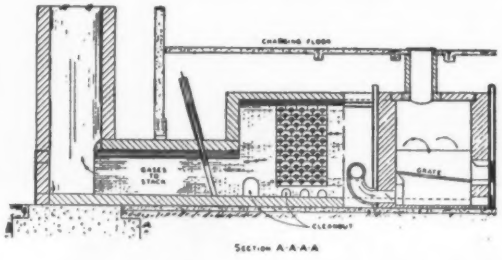

Section A-A-A-A

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nation into the water system at times of main breaks and new connections. Fittings and pipes are thoroughly cleaned and then disinfected with a sodium hypochlorite spray, and when feasible this is followed by flushing and chlorination. Asbestos rope has been substituted for hemp for all repair work, and the resulting freedom from bacterial contamination has adequately justified this change.

## Off-Street Parking Requirements

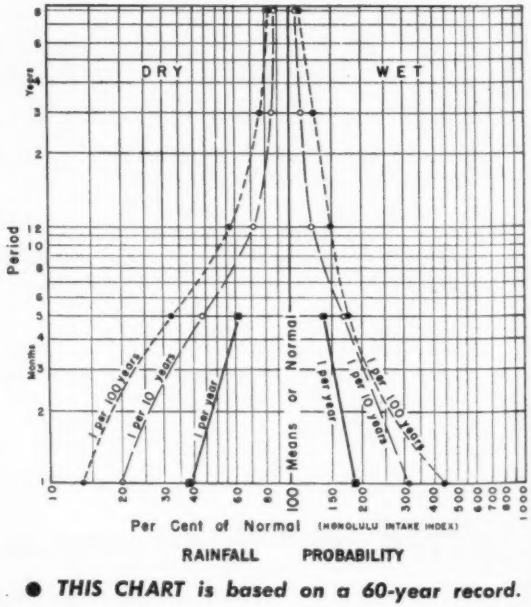
Youngstown, Ohio, has adopted an ordinance which establishes parking requirements for theaters, super markets, dance halls, and other places of public assembly. Theaters are required to provide one parking space for each 10 seats, super markets one space for each 300 square feet of floor space, funeral homes one space for each 100 square feet of floor space, hotels one space for each six bedrooms, and multiple dwellings and apartments one space for each dwelling unit. Dance halls must provide one space for each 100 feet of dance floor area and stadiums and sports arenas one space for each eight seats.—*Public Management.*

## Costs of Refuse Collection

A total of 18,856 tons of refuse were collected in Youngstown, Ohio, during 1948 at an average cost of $8.16 per ton. The average amount of refuse collected was 1,571 tons per month, but collections ranged in volume from 1,349 tons in February to 1,971 tons in September. Costs of collection increased over previous years because of wage increases and spiralling costs for all items for operation and maintenance. Complaints received average 0.26 per ton of refuse collected, the same in 1948 as in 1947.

## A Duration-Deviation Probability Chart

The chart shown in the accompanying illustration, based on nearly 60 years' record of rainfall at Honolulu, Hawaii, shows the most probable frequency of percentage deviations of rainfall in the Honolulu intake area, above and below normal or average, for various periods from one month to 8 years. For ex-




● ***THIS CHART is based on a 60-year record.***

ample, it shows that rainfall as low as 47, 26, and 16 per cent of normal for a 2-month period are likely as not to occur once a year, once in 10 years, and once in a century, respectively. The chart is based on smoothed frequency distributions of about 700 single month and 5-month periods, and smaller numbers of 1-year, 3-year, and 8-year periods, for the average of 10 stations in the Honolulu intake area. The monthly data are computed without allowing for systematic seasonal normals, as is shown by the narrowing of the graph at one year.

## Per Person Garbage and Rubbish Production

From a survey made by the Maryland Bureau of Sanitary Engineering in 1948, figures on the average per capita production of garbage and rubbish were obtained from four communities operating incinerators. The range was from 601.8 pounds to 687.6 pounds, with an average production per person per year of 632.6 pounds. Eight Maryland communities have incinerators, ranging in capacity from 600 tons in Baltimore to 3 tons in Rising Sun.

## Bid Prices on Sewer Construction

Bids were received April 6 for the construction of sewers and appurtenances in Sanitary Sewer District No. 1, Douglas Co., Nebr. Seven bids were received, ranging from $129,470 to $198,657, but most of the bids were around the $140,000 range. Various unit bid prices are: 8-inch sewer in place, 36,280 ft., low bidder $1.80 per ft.; other bids in order of aggregate bid, $2.00, $2.00 and $1.85; 10-inch sewer in place, 5,140 ft., low bidder $2.25 per ft.; other bids, $2.30, $2.40 and $2.10; 18-inch sewer in place, 1,116 ft., low bidder, $3.50; other bids, $4.00, $5.00 and $4.50. Pressure pipe, class 150, 2,000 ft., asbestos cement, low bidder $2.35; other bidders, $2.45, $2.95 and $3.00; cast iron, low bidder, $2.35; other bidders, $3.55, $2.95 and $3.50.

On the construction of 117 manholes, bids for brick structures were: Low bidder, $190 each; other bidders, $210, $200 and $225. For concrete manholes, low bidder $175 (for concrete blocks); other bidders, $163.65, $190 and $225.

The four low bidders on the basis of the total bid are included in the above. The work also included construction of two pump stations and an inverted siphon.

## Inflation of Rubber-Tire Rollers

Available data indicate that, for rubber-tire rollers, the contact pressure between the tire and the soil is of more importance in compaction of soil than is the wheel load. Since increasing inflation of a tire decreases the area of contact it increases the contact pressure. This in general increases the density of compaction, but up only to the point where the pressure equals the bearing capacity of the soil. For most effective use of a roller on any given job, this bearing capacity should be determined and considered.

## Cost of Laying Cast Iron Pipe in Honolulu

Costs of laying cast iron water pipe in Honolulu during the years 1947 and 1948 were as follows: 6-inch, $5.07 and $5.92; 8-inch, $6.75 and $6.21; 12-inch, $15.26 and $12.55; 24-inch, $22.69 and $31.39. In 1947, 6,907 ft. of 42-inch pipe were laid at a cost per foot of $76.21.


**This Littleford Roller was Designed for Highway & Street PATCH WORK**

Here's the Roller that has the only Hydraulic Raising and Lowering Device. It's a patented Littleford feature that makes it possible to change the Trail-O-Roller from Trailing to Rolling or Rolling to Trailing position in only 2 minutes time. This Portable Roller was designed for patch work, yet gives as much compaction as a 5 ton tandem and can be used for rolling Highways, Streets, Runways, Parking Areas, Service Cuts, etc.

The Trail-O-Roller is the only portable roller that can cut the cost of rolling operations, because it's engineered to cut labor; dozens of rolling jobs can be done in a day's time. No Contractor or Highway Department can have a more versatile roller than the Trail-O-Roller. It's the Modern Roller for Modern Road Repair Work. See your nearest Littleford Distributor for further details.

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# PUBLIC WORKS DIGESTS

Sewerage and Refuse page 50

Highways and Airports page 58

Water Supply page 66

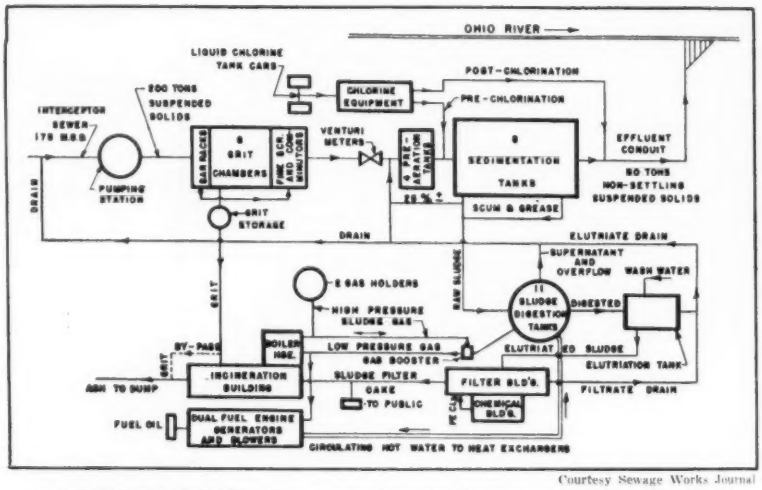
● *This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.*

## SEWERAGE AND REFUSE DIGEST

### Determination of Suspended Solids

"Standard Methods" describes suspended solids as the weight removed by filtration through an asbestos mat in a Gooch crucible, or through filter paper in an aluminum dish. Objections to the former are the excessive time required, frequency of clogging, and dependence of value obtained on the thickness of the asbestos mat. The aluminum dish method is more rapid but is subject to large errors from sorption of water. A filter paper method is used at the Richmond-Sunset plant which, by use of blank paper, provides corrections for changes in sorbed water between weighings.

K. Fraschina—"Filter Paper Method for Suspended Solids Determination;" *Sewage Works Journal*, March.




Courtesy Sewage Works Journal

● ***FLOW DIAGRAM** of proposed central sewage treatment plant.*

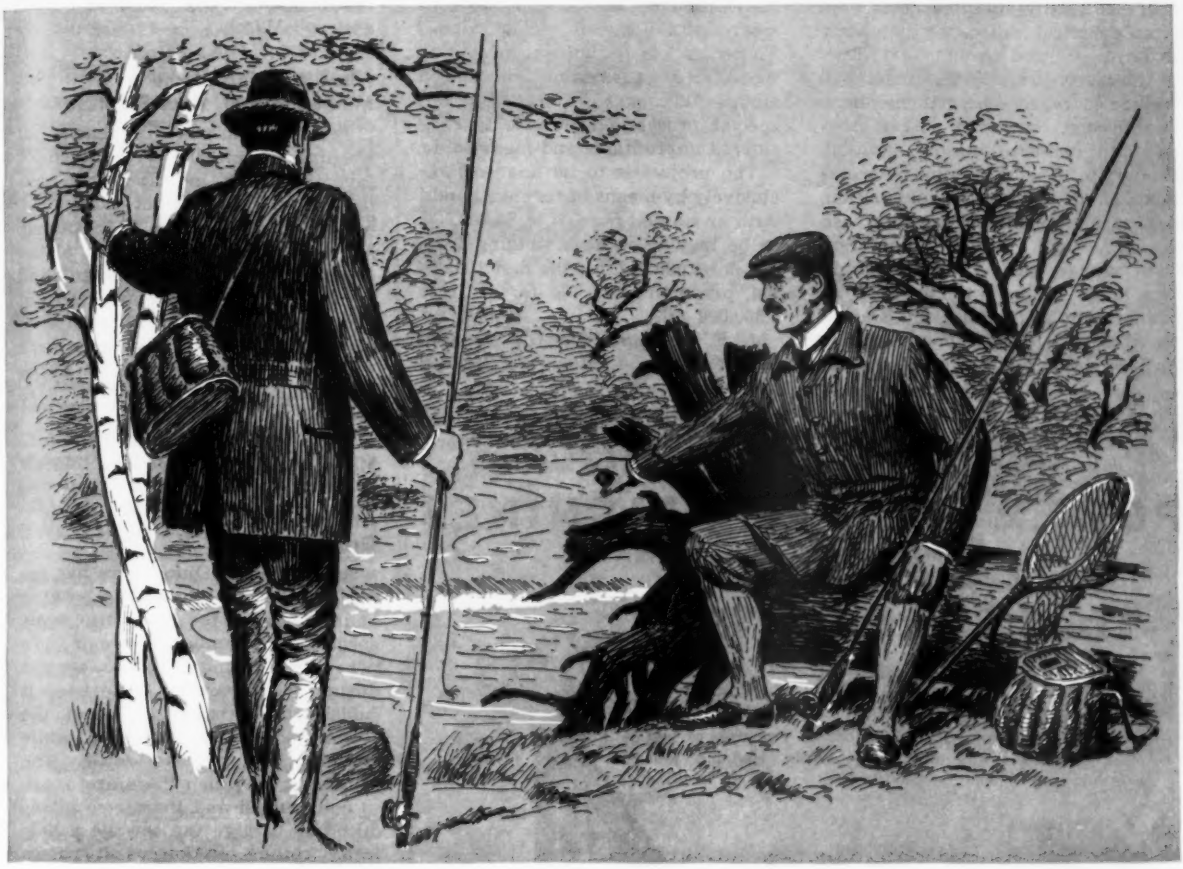
### Sewage Disposal For Allegheny County, Pa.

The Ohio River receives from Pittsburgh and its suburbs the organic waste load with a population equivalent of 1,334,300, while it brings from above that city a load ⅓ greater, plus 1,032,000 tons per year of acid waste. To remedy this condition, the Allegheny County Sanitary Authority (created under a 1945 Act of the State Legislature) made an exhaustive study of the entire problem and prepared preliminary plans for four projects, involving one, three, five and eleven treatment plants respectively. Estimates of costs of construction and of operating charges of each were based on 1947 price levels. The cost of Project No. 1 with one central plant was estimated to cost $82,000,000, $7,883,000 more than the 5-plant project, the cheapest one; but it was considered that its merits and intangible values outweighed this; some of the reasons being fewer plants, more efficient absorption and treatment of greater quantities of industrial wastes, reduced peak loads, and more efficient supervision.

About 52.5 miles of the main intercepting sewer will be laid in the beds of the rivers, this being estimated to cost $8,000,000 less than land construction through the narrow streets and crowded buildings. There will be 12 inverted siphons and 21 miles of force main.

During the study, sewage flow was measured at 35 locations and showed an average of 95 gcd. Allowance for garbage grinding, increased industrial developments and other additions, including 25,000 gal. per mile per day of infiltration, gave an estimate of 121 gcd in the year 2,000; and a population of 2,046,700 was estimated for that date. It was decided that, for the present, primary treatment and preaeration, with chlorination during critical low-water periods would be sufficient; it being believed that this would reduce the organic pollution by at least 50% and the B.O.D. to approximately 150 ppm. The concentration limits for treatment plant influent were set as follows: pH, 5.0; total iron, 5.0 ppm; copper, 3.0 ppm; chromium, 5.0 ppm; cyanide, 2.0 ppm. Mineral oils, combustibles and acetylene generation sludge to be excluded, and free mineral acids to be neutralized at source.

When, during storms, the flow at the plant exceeds 250% of the aver-




"Look at those trout belly-up, Joe that means big trouble!"

Sanitary engineering has achieved notable progress in stream pollution control during the past half-century. Sewage treatment was introduced in 1899, the year our Company was organized. Today, more than 6,000 sewage treatment plants serve over half of our urban population. And substantial progress is being made in decontaminating industrial wastes discharged into streams and other waters.

Water supply and gas service have also made notable contributions to better health and living in the past 50 years. Today, more than 12,000 public water supply systems serve 85 million people with safe and palatable water. More than 20 million families are furnished with gas for cooking and heating.

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To those responsible for the great progress in water supply, gas and sanitation service and their contribution to better health and living over the past fifty years, America pays tribute.

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age, electrically operated gates with remote control will cause the excess to be discharged through overflows to the river. Primary treatment will include coarse screens, grit chambers, fine screens, comminutors, grit storage and incineration, pre-aeration, primary settling, skimming, chlorination, sludge digestion, elutriation, dewatering sludge, incineration, ash disposal, and power generation from sludge gas. A special study was made of the practicability of incinerating wet undigested sludge, but this will not be adopted "until furnace equipment manufacturers develop incinerators which they consider satisfactory for such services." The engineers recommend providing means for furnishing dewatered sludge filter cake for fertilizer, but special processing for sale is considered unprofitable and inadvisable.

The project is to be financed exclusively by means of revenue bonds, with an annual burden of $4,869,000, to be met by charges ranging from 18c per 1,000 gal. for the first 100,000 gal. per quarter, to 7c for all over 3,350,000 gal.

J. F. Laboon—"Sewage Disposal Program of the Allegheny County Sanitary Authority;" *Sewage Works Journal*, March.

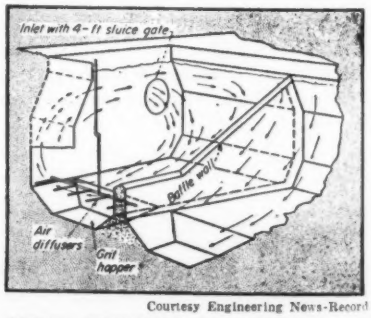
### Filter Washing at the Minneapolis-St. Paul Plant

Tests of various frequencies of washing vacuum filters, continued for several months, indicated that continuous washing was not economical, with pressures of 60 to 75 lb. per sq. in.; there was excessive wear of the filter cloths, and they seemed to blind out sooner than under intermittent washing. It seemed to be most economical to wash at least once each hour for at least one revolution of the drum; or oftener under difficult filtering conditions.

From Annual Report of Kerwin L. Meck. *Sewage Works Journal*, March.

### An Aerated Grit Chamber

At Columbus, Ohio, there has recently been put into service what is believed to be the first large-scale aerated grit chamber. The main purpose of diffusing air into sewage during grit separation is to keep it sufficiently turbulent to keep the organic solids in suspension while allowing the grit to settle. The chambers, of which there are 4, are so constructed and the air so introduced as to give the sewage a helically rolling motion as it passes through the chamber. The general shape of the chamber is that of a conventional aeration tank, and air is applied through swing diffusers. A longitudinal channel under the diffusers receives the grit, which is swept into it by the rotary motion of the sewage as it passes transversely across the floor, while the diffusers raise the sewage with its suspended organic matter. The grit is removed from the channel by means of clam buckets, the diffusers being raised out of the way to permit this. The length of these chambers is only 83 ft. while conventional grit collector channels would




Courtesy Engineering News-Record

***HOW SEWAGE is "rolled" in aerated grit chamber.***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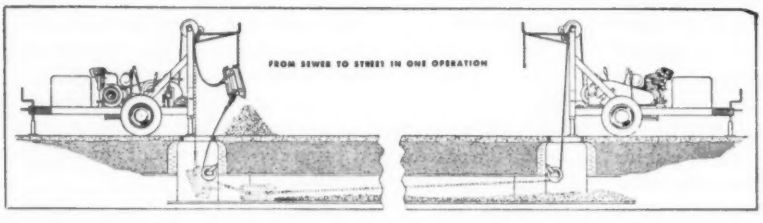


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have been 125 ft., and the total width of the four chambers is only 43.75 ft. as compared to 60 ft. Advantages are lower first cost; grit particles are carried down to the floor by the rolling motion; variations in depth due to downstream conditions will not affect velocity of rolling motion, which can be adjusted independent of the quantity of sewage; also some dissolved oxygen will be added to the sewage.

Nye Grant—"Aeration Speeds Grit Removal"; *Eng. News-Record*, April 28.

### Oklahoma City's Sewage Treatment Plant

Oklahoma City drains into two streams, but both carry little or no flow the greater part of the time, and effluents from the existing primary treatment plants have created a nuisance for which the city has paid considerable sums for damages. A new treatment plant is under construction to treat 25 mgd of sewage containing packing house and slaughter house wastes and at times large quantities of oils. As the effluent will receive little or no dilution, it was considered necessary that it contain nitrites and nitrates. Two-stage biofiltration would produce an effluent low in BOD but also in nitrates; activated sludge would ordinarily meet the nitrate requirement but tends to be temperamental when the sewage contains industrial wastes, and a two-stage high-rate trickling filter followed by a low-rate filter was adopted. This is designed to treat combined domestic sewage and packing house waste having a BOD of 375 ppm and 500 ppm suspended solids, the packing house plants being required to remove grease, hair and paunch manure from their wastes. Oil, grease and scum are skimmed off and burned. The sewage is screened, comminuted, passed through Dorr detritors, then mixed with recirculation from the primary filters, it flows through clarifiers giving 2 hr. detention at design flow, the sludge and scum from which are pumped to digesters. The effluent then flows to four primary high-rate filters 116 ft. in diameter, on which it is dosed at 25 mgd per acre. The effluent flows to intermediate clarifiers and thence to 8 second-stage low-rate filters (or directly to the river at times of high water), on which it is distributed at 5 mgad. The final effluent will be used for secondary recirculation, watering lawns, flushing sludge lines, etc. Eight digesters have a capacity of 3.6 cu. ft. per capita of equivalent population; they

(Above) Typical small-size R-C Meter with inclined differential gauge, with top inlet, and outlet in bedplate.

(Right) Example of large-size, low-pressure R-C Meter, side inlet box and bottom outlet, with a P.V.T.T. Recorder.

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R-C Meters are built in 31 standard sizes, with capacities from 4,000 to 1,000,000 CFH. Indicating and recording instruments are available for all types. Send for details in Bulletin 40-B-14 or write us about your specific problem.

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can be operated to give two-, three- or four-stage digestion.

Webster L. Benham — "Oklahoma City Builds Two-Stage Trickling-Filter Sewage Disposal Plant"; *Civil Engineering*, May.

### Controlling Filter Flies

The Ridgewood, N. J., treatment plant contains a nozzle-type trickling filter 0.6 acre in area and 5½ ft. deep, so constructed as to permit flooding for control of filter flies. Flooding was practiced for eight years, but did not fully control the flies, even with weekly or twice-weekly flooding, and use of DDT was tried. This was applied at the rate of 1 ppm of the day's flow, but during 2 hr. only at the rate of 12 ppm, equivalent to 8.3 lb. per acre-foot. After 24 days, dosing again became necessary. Meantime, exposed wall surfaces were sprayed weekly by hand. Later, efficiency was increased by spreading the dosing over a longer period. Suddenly, in August 1947, a new species of psychoda appeared, smaller and less hairy than the *albipunctatus* which was present originally, and on which DDT had little effect.

When the psychoda season of 1948 began, in April, DDT was tried again, but was ineffectual, even at rates up to 34 ppm. Other compounds were tried, including Isotox, Vapotone, Chloroben and Nacconal, but with no success. Finally Pennco BHC was tried; the dosing tank, filter and final clarifier were taken out of service, and 25,000 gal. of sewage containing 15 gal. of BHC E-11 and 2 qt. of emulsifier was recirculated through the filter for 12 hr., each part of the filter receiving a dose for 10 min. once an hour. This was a complete success. After 28 days, 10 gal. of BHC was applied; and 5 gal. near the end of the season. Possibly the dose used was higher than necesary.

John Hood—"Successful Filter Fly Control"; PUBLIC WORKS, May.

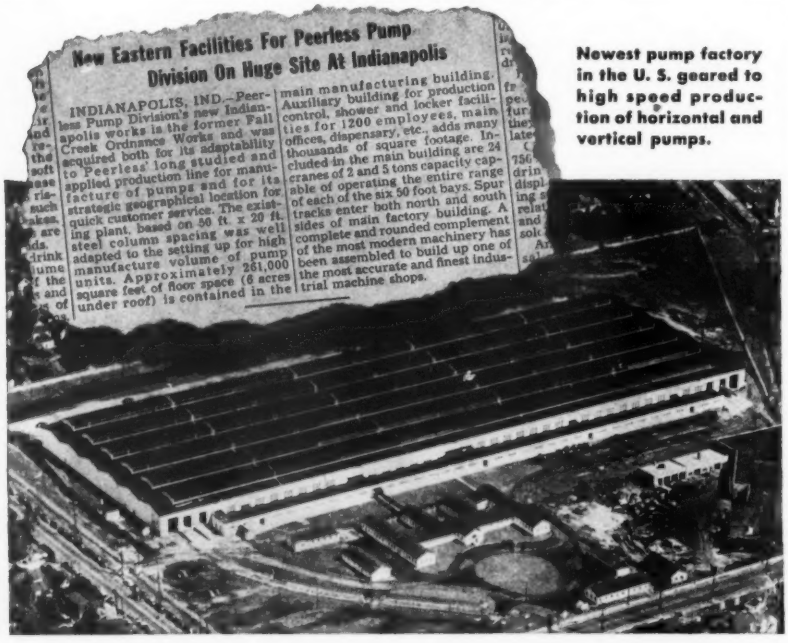
### Pollution Abatement By Manufacturing Plant

A small plant at Jeannette, Pa., which manufactures turbines, blowers, etc. and was polluting a stream with soluble and lubricating oils, waste pickle liquor and rinse water, and cyaniding quench waters, has abated this without a major outlay of funds. The oils, which formerly had passed into floor drains leading to the plant sewers, is now collected by drip receivers and dumped on the coal stockpile. A skim baffle was installed on the spray pond, and an earthen basin was provided at the sewer outfall to act as an oil trap in case of accidental oil spills. Waste pickle liquors are neutralized in the pickle tank by periodic addition of alkali, and sludge is disposed of in a lagoon on the plant property. Small parts of generators are dipped in cyanide salt baths and then rinsed. Formerly the rinsing was done in a continuous flow of water, which entered the main waste flow; now the parts are rinsed in batches and this rinse water disposed of separately.

"Housekeeping Solves Small-Plant Stream Pollution Problem"; *Engineering News-Record*, April 28.

### Industrial Plant Waste Disposal Surveys

A survey to obtain basic information essential to the selection of adequate pollution abatement procedures, may advantageously be conducted in four basic steps: Survey of plant and receiving streams; research for devising abatement procedures or processes; establishing applicability



New Eastern Facilities For Peerless Pump Division On Huge Site At Indianapolis
INDIANAPOLIS, IND.—Peerless Pump Division's new Indianapolis works is the former Fall Creek Ordnance Works and was acquired both for its adaptability to Peerless' long studied and applied production line for manufacture of pumps and for its strategic geographical location for quick customer service. The existing plant, based on 50 ft. x 20 ft. steel column spacing was well adapted to the setting up for high manufacture volume of pump units. Approximately 261,000 square feet of floor space (6 acres under roof) is contained in the main manufacturing building. Auxiliary building for production control, shower and locker facilities for 1200 employees, maintains offices, dispensary, etc., adds many thousands of square footage. Included in the main building are 24 cranes of 2 and 5 tons capacity capable of operating the entire range of each of the six 50 foot bays. Spur tracks enter both north and south sides of main factory building. A complete and rounded complement of the most modern machinery has been assembled to build up one of the most accurate and finest industrial machine shops.

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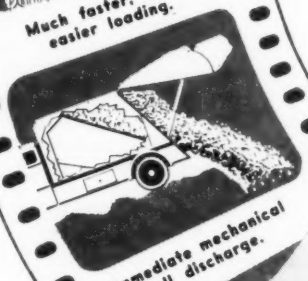

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and economics of methods; survey of layout and physical aspects of existing plant. An important basic concept is that pollution abatement is not necessarily synonymous with waste treatment. Other solutions that may be possible include: 1—Elimination of wastes or change of their characteristics by recovery or utilization, by changes in process or in operation routine. 2—Reduction in quantity of waste. 3—Segregation of different types of wastes and/or the separation of wastes from clean water. The procedure selected must provide adequate treatment 100% of the time.

Roy F. Weston, Robert G. Merman, and Joseph G. De Mann—"The Industrial Plant Waste Disposal Survey;" *Sewage Works Journal*, March.

### Digestion of Wool Scouring Wastes

Most literature on treatment of wool scouring wastes states that biological processes are not applicable, due primarily to the high grease content. But the author, presented with the problem of treating such wastes in a municipal sludge digestion and trickling filter plant, operated for 2½ months a pilot plant consisting of two 500 gal. anaerobic digestion tanks connected in series. The wool scouring wastes treated carried an average of 28,000 ppm of volatile matter, including 11,000 ppm grease, and had an average BOD of 10,000 ppm. For a 3-week period the plant was operated with a loading of 0.06 lb. of volatile matter per cu. ft. per day; the gas yield was from 8.6 to 14 cu. ft. per pound of volatile matter added, and there was a 65% reduction in volatile matter and 90% reduction in grease. It is believed that the loading can be increased to 0.1 lb. of volatile solids per cu. ft. per day for a 20-day digestion period, and that anaerobic fermentation is a practicable method of treating wool scouring wastes.

M. T. Singleton—"Experiments on Anaerobic Digestion of Wool Scouring Wastes;" *Sewage Works Journal*, March.

### Treatment of Compressed Yeast Wastes

A pilot plant for treating compressed yeast wastes was constructed at Old Bridge, N. J., consisting of two 16,000 gal. tanks for continuous upflow digestion, kept at a temperature of 85° F, operated both in parallel and in series. Five years of operation gave the following results: Two-stage digester operation produced greater BOD reduction per unit BOD loading than did one-stage. Loadings per cu. ft. per day of 0.45 lb. total solids, 0.34 lb. volatile matter, 0.13 lb. BOD, and 0.017 lb. organic nitrogen were attained. Average removals of 54% total solids, 68% volatile matter, 85% BOD, and 74% organic nitrogen were effected. Total gas production amounted to 7.5 cu. ft. per lb. volatile matter.

Willem Rudolfs and Eugene H. Trubnick—"Compressed Yeast Wastes Treatment;" *Sewage Works Journal*, March.

### Eliminating Roof Water From Sewers

Like many other cities, Wadsworth, Ohio, found that many of its residents were draining their roofs and basements into the sanitary sewers, although this was forbidden by ordinance. Storm sewers had been laid in some streets and received the rainwater from a few residences. To prove this illegal use of the sanitary sewers and locate the offenders, rubber balls were purchased of two sizes—½" of sponge rubber and 1½" hollow, and were numbered with waterproof black india ink. These were dropped into downspouts and basement drains, and a record made of the number of the ball used at each residence. Then the balls were collected from the sewage treatment plant and at the storm sewer outlets. They usually appeared within 2 or 3 days. If any did not, others were dropped in the residences where the missing balls had been placed. With this proof in hand, residents were advised that, if correction under city supervision were not made within 30 days, the city would do the work and assess the cost again the owner. In only a few cases was it necessary for the city to do the work.

Frank G. Randall—"Elimination of Storm Water from Sanitary Sewers;" *Sewage Works Journal*, March.

### Treating Dye House Wastes

Natona Mills at Dallas, Pa., has been constructed recently to weave synthetic fibers into fabrics and laces, which are dyed or bleached. Liquid wastes are produced by bleaching, scouring, rinsing, dyeing, sizing and finishing. According to Pennsylvania state law, it was necessary to have a waste treatment plant in operation before the wet processes of the mill could be started. Also, because of the limited dilution of the receiving stream, the plant must be able to remove at least 85% of the 5 day BOD. To learn what character of waste to provide for, those from a similar plant elsewhere were studied. Flocculation tests were made with alum, ferric sulfate, ferric chloride, lime and sodium hypochlorite. Where black dye wastes were included, calcium chloride did not work well, but a combination of copperas and lime gave a clear effluent. However, further reduction in BOD, oxygen consumed and chlorine demand required some secondary treatment. It was decided to build a chemical precipitation plant consisting of a holding and equalizing tank, provided with blower and air diffusers, to permit treatment at a uniform rate; a chemical feeder suitable for lime or calcium chloride and one for alum, copperas or ferric sulfate; a mixing tank, flocculator, settling tank, and elevated sludge holding tank. A pond providing 20 days' detention, with a pump and sprays, will be used temporarily for oxidizing the effluent while studies are made of the effluent actually produced to determine the best method of secondary treatment. This plant has not yet been operating at full capacity, but the untreated wastes average a BOD of 700 ppm and suspended solids 250 ppm. These were reduced 70% and 60% respectively by precipitation; and the pond effluent contained about 20 ppm suspended solids and under 10 ppm BOD.

S. I. Zack—"Developments in the Treatment of Dye House Wastes"; *Sewage Works Engineering*, March.

### Standards of Stream Sanitation

In general, such standards have fallen into three general categories: (1) limiting stream dilution criteria; (2) standards for the treatment of wastes and quality of effluents at their points of discharge into water-courses, and (3) standards for the quality of the stream waters themselves. The dilution criteria recommended range from 2 to 7 cfs per 1,000 persons. This type takes no account of the stream's self-purification capacity. The second type offers a simple and readily interpreted means of establishing a preliminary basis of stream pollution correction, setting a definite and readily measurable goal for all polluters alike; but it affords no distinction as to the strength and character of various wastes, makes no allowance for variations in the capacities of different types of streams for dilution and self-purification, and thus may tend to over-correct in some cases and under-correct in others.

The third type is concerned primarily with the stream itself and has been receiving an increasing amount of attention. It involves some difficult problems of evaluation and application, but its advantages to the water user are so great that it is becoming increasingly favored

as a practical working tool, especially where stream sanitation can be handled as a regional problem. Of 25 states using standards, 22 use stream quality, 3 use wastes treatment, and both are used by 8 states. Closely associated with the stream quality standard is the idea of stream zoning, which recognizes practical lines of demarcation between various necessities of stream use.

Bathing water standards need more precise definition based on well-correlated bacteriological and epidemiological evidence. Standards for water supply uses should include limiting requirements for toxic and taste-producing chemical substances. Standards of streams used for irrigation and other agricultural purposes should be more precise and comprehensive. Also more attention should be paid to the essential and desirable qualities of stream waters for various industrial uses.

H. W. Streeter — "Standards of Stream Sanitation"; *Sewage Works Journal*, January.

### Prestressed Digestion Tanks At the Hyperion Plant

At the sewage treatment plant for Los Angeles, 18 sludge digestion tanks, 111 ft. inside diameter, are being constructed. Bids were asked on conventional reinforced concrete design and on use of the wire-wrapped prestressing system; also on roofs of fixed steel, flat slab and girder, or reinforced concrete domes. The award was made for prestressed tanks with domed roofs. The walls are made 20½" thick inside the wire wrapping—nearly three times that necessary for strength—for easier construction and more effective heat insulation. Each tank was built in four quarter-sections, poured alternately. Forms were left in place for 24 hr. or more, and each section was cured for 7 days before the adjacent one was poured. After all four sections had been poured and cured, the tank was wrapped with wire stressed to 130,000 to 150,000 psi. This decreased the tank diameter by about ¾". It was then coated with gunite with a minimum thickness of ⅝" over each strand.

"Hyperion Digesters Are Mass-Produced;" *Engineering News-Record*, April 14.

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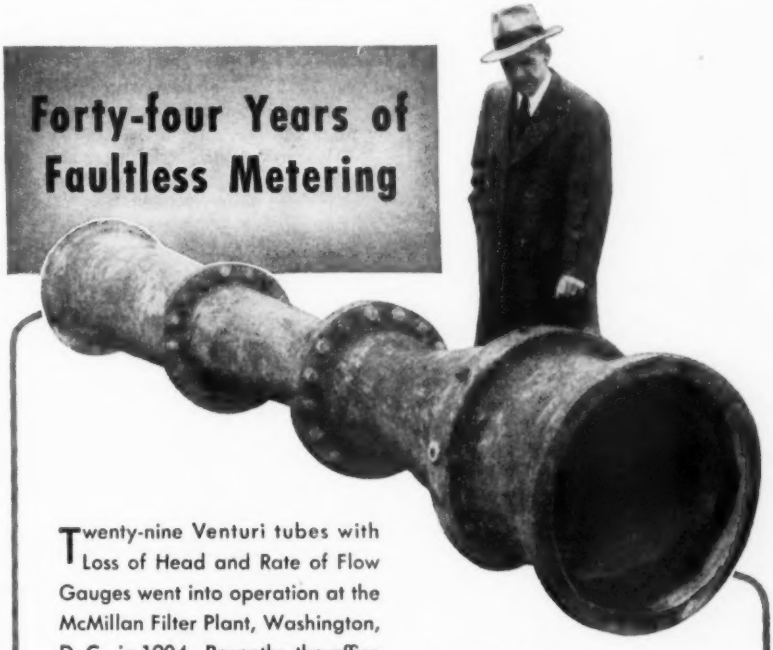

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PUBLIC WORKS DIGESTS

# THE HIGHWAY and Airport Digest

### Bituminous Pavements In North Carolina

The Bituminous Engineer of the North Carolina Highway Com'n gives a comprehensive discussion of the designing, constructing and maintaining of bituminous pavements. In the southeastern section of the country he does not think it necessary to extend a prepared base through the shoulders; although it may be desirable to install drains through impervious shoulders at places, an objection to this practice being that water from clogged ditches or melting snow can back up the drains to beneath the pavement. Three types of material are described for subbase construction, and two for base courses. The subbase course is made 3" to 6" thick; the soil-type base course, 4" to 12"; macadam base, 4" to 10"; soil-cement, 5" to 6"; and soil bituminous, 3" to 6". For bituminous surface courses, single surface treatment, using coarse sand or screenings as the only aggregate, is the least expensive and gives good results where used by light pneumatic-tire traffic, but not on soil-cement bases. Double bituminous surfacing uses 1¼" to ½" aggregate, rolled, and covered with sand. North Carolina uses cold mix sand asphalt where well-graded local sand is available. Hot plant-mix pavements are considered to be the highest type. For secondary roads they use one inch of sand asphalt course on a prepared base.

T. V. Fahnestock—"How to Build Better Bituminous Pavements"; PUBLIC WORKS, May.

### Stores Department Of California Highways

Purchases for the California Div. of Highways processed through the Stores Department amount to about 7.5 million dollars per year. With the exception of heavy road equipment and automotive units, all supplies, equipment, and materials are purchased through this department. It also analyzes needs for months ahead and obtains stocks of materials in advance but avoids overstocking. It prepares specifications, investigates to obtain the best materials for the job in hand, and keeps abreast of price trends, supply and demand. Most materials are now delivered from stock with 48 hrs. instead of a minimum of 30 days as before. It standardizes tools, first taking a poll of likes and dislikes in various hand tools from the workmen who actually use them. In July, 1946, anticipating rising prices and scarcity of steel products, the department bought 4,500 tons of steel H-piling at $3.72 per 100 lb., now costing $5.30.

In selecting three warehouse sites, each to accommodate at least four warehouses of 33,000 sq. ft., economic distribution was considered essential, including railroad spurs and conveneince to the hubs of motor freight lines. The current cost of operating the warehouses is approximately 8% of the business handled.

Milton Harris — "Stores Department Embodies Best Commercial Practices for Economy"; *California Highways and Public Works*, January-February.

### Draining by Means of Sumps

Two lanes of concrete highway 5.7 miles long are being constructed in California paralleling the existing two lanes of U. S. Highway 99 and the tracks of the Southern Pacific Railroad. The country is rolling, of sandy soil which rapidly absorbs ordinary rainfalls. The natural drainage is across the highway, but the railroad which parallels it on the downhill side has no drainage openings and has been known to flood the road in several locations during heavy storms. To prevent this, some thirty sumps are being constructed. A sump consists of a 5-ft. hole carried 15 to 20 ft. deep to hardpan and backfilled with ¾" to No. 4 rock, with a vertical 12" perforated metal pipe placed in the center and extending from about 6" below the ground surface to within a foot of the hardpan. An intake structure to collect silt will consist of a 36" corrugated metal pipe 3 ft. long, with side openings, concrete bottom and wood cover. The sumps will be cleaned occasionally by jetting the silt from the filter rock into the center pipe and removing it therefrom.

A. N. Lund—"New Section of Divided Highway on U. S. 99;" *California Highways*, March-April.

### Maine's Portable Crushing Plant

Commercial plants for furnishing crushed stone and gravel for Maine's highways are limited in number and located at relatively few points, making supply uncertain, with long hauls necessary and transportation costs high. Before the beginning of the 1948 season the state bought a portable gravel crushing and screening plant operated by a 160-hp diesel engine, costing $34,000; believing that it would be cheaper to move the plant than truck the material long distances. During the 1948 season, about 60,000 cu. yd. of material was produced in 9 different gravel pits for 10 jobs, the plant having traveled 1500 miles. Crusher-run material had cost 75¢ per cu. yd. (commercial price $1.25); surfacing material $1.00 (commercial price $1.50). Also the shorter haul to the jobs meant considerable saving. The saving for the season, in excess of all operating costs, repairs, wages and the rental of a ¾-yd. shovel to feed the plant and of 3 or 4 trucks to haul the output, was about $10,000. If the saving in cost of transportation be added, the entire cost of the plant could be written off in one season.

John C. Burnham—"Crushing Stone for Highway Surfaces;" *Roads and Streets*, April.

### Changing a 3-Lane Highway Into a 4-Lane

On California's Coast Highway a recently completed 4-lane divided highway connects with an old 3-lane pavement 30 ft. wide, which forms a traffic bottleneck. To eliminate this, the old pavement will be widened to 77 ft. by placing 4" of plant-mixed surfacing laid on 16" thickness of selected pavement base

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|---|---|
| New York | 200 |
| Baltimore | 97 |
| Cincinnati | 78 |
| Miami | 40 |
| Detroit | 150 |
| Indianapolis | 30 |
| Richmond | 19 |
| New Orleans | 26 |
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material treated with Class C medium seal coat. A central dividing strip will be formed by doweling concrete curbs spaced 4 ft. apart to the existing concrete pavement, which will be surfaced with plant mix of varying thickness.

Ray A. Collins—"Malibu Project"; *California Highways*, March-April.

### Training Productive Highway Employees

Early this year the Virginia Dept. of Highways began comprehensive training of all its productive employes; those at the top as well as the bottom. The results expected are better morale, overall increase in efficiency and reduction of accidents. The program stresses better supervision; clearer knowledge by productive personnel of the problems of their supervisors and by the supervisors of the capabilities of their men and equipment; and above all, encouraging pride in the job. The school is being conducted in two divisions, one giving instruction on an engineering and supervisory level once a year; the other consisting of a series of periodic schools for productive personnel. The schools are localized as much as possible, so as to reach all employees with the least possible interference with their regular duties.

The first stage of the periodic schools is designed to orient both old and new employees in department policies and regulations; to provide for thorough discussion of the limits and uses of equipment, of motor vehicle laws and preventive maintenance. The second stage is concerned primarily with increasing production through preventive maintenance and repair of equipment. The final stage is devoted to the correct operation of equipment.

Chas. B. Leech, Jr.—"Virginia Training Its Productive Personnel;" *Better Roads*, April.

### Highway Costs Stabilizing

The Associated General Contractors of America obtained, from its more than 100 local affiliated contractor associations, their ideas concerning the tendency of construction costs in 1949. These indicated that there will be more construction than in 1948; that materials (except cement and steel in some areas) are in relatively plentiful supply; and that there is more skilled labor available. Concerning highways, specifically, 58% believed that costs were stabilizing, 18% that the tendency was up, 18% that it was down; and 6% indefinite. Concerning the amount of work on the market, 24% reported it the same as 1948; 27% more, 30% less; 5%, situation favorable.

"Construction Costs Are Stabilizing"; *The Constructor*, March.

### Contractors' Equipment For Snow Removal

Minnesota finds that the only safe road in winter is a dry one, but the department with its regular forces can handle only a limited mileage of the 11,000-mile trunk system. The amount of icing to be removed varies widely from year to year, and to acquire sufficient equipment for the worst winters would involve enormous expense. The most proficient all-around unit to use was found to be the powerful and heavy motor grader capable of working at fast speeds. Contractors in the state own a large number of motor graders that usually stand idle during the winter, and their use for this purpose would be mutually advantageous. Beginning seven years ago, the department has been receiving

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bids from contractors for use of their equipment, including fuel, oil, operator and all other operating expenses except cutting edges, scarifier tips and cross-chains for tire chains. The state does not guarantee use of the equipment and the bidder need not go to work unless he desires to do so at the time he is called. The department now has 160 motor graders listed by 100 owners, well distributed throughout the state. Possibly large power scrapers owned by contractors could be used for removing snow if some means could be found for compacting it before loading.

C. L. Motl—"Using Contractors' Equipment for Winter Maintenance;" *Roads and Streets*, April.

### Paving Over Street Car Tracks

Detroit discontinued street car service on Grand River Ave. in 1947 and has repaved the street without removing the rails. The 12.6 miles was paved with sheet asphalt on a bituminous binder course with a total minimum thickness of 2¼". Sheet asphalt was chosen because it permitted economy in feathering out the edges and conformed to the prevailing type of surface. The surface was covered with marble chips, which increased the anti-skid properties and lightened the color. In laying, the track grooves first were blown out with compressed air, then sprayed with emulsified asphalt and filled with a sand-asphalt mixture. A 1" binder course covered 20 ft. of the 33 ft. car-track area and was covered with 30 ft. of 1¼" sheet asphalt and 18" of feathering on each side. Most of the construction was done at night.

C. H. Brown—"Detroit Resurfaces"; *American City*, March.

### Equipment for Soil-Cement Subgrade

In building a cement-concrete pavement 8" thick on a cement-treated subgrade 4" thick, 2 miles long, in Los Angeles, Calif., the soil was scarified to a depth of 4" and windrowed with a motor grader. Portland cement amounting to 3½% by weight was spread on the windrow and mixed with it by a Woods mixer towed by a D8 Caterpillar tractor, about 8% of water being applied in the mixer from a tank truck traveling alongside the mixer. The mixed material was spread to a uniform depth between steel side forms by means of a Jaeger spreader. Not more than 30 min. elapsed between the time water was applied in the mixer and the


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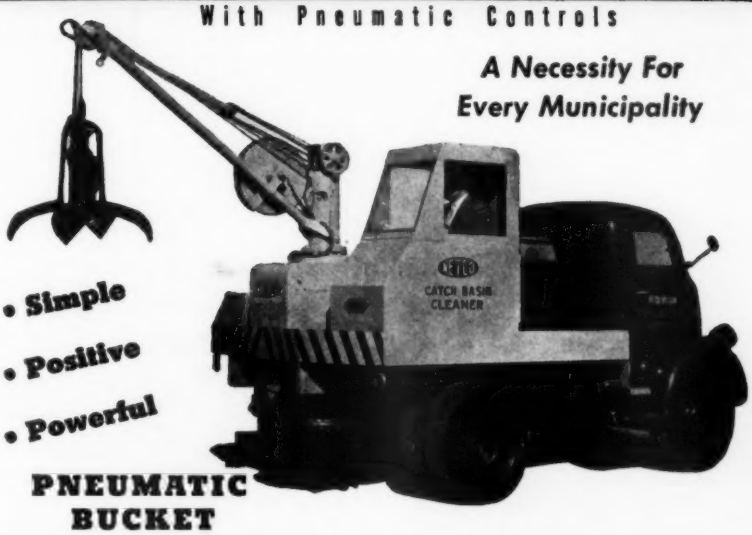


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- The Netco Catch Basin Cleaner can be mounted on any short wheel base truck having at least 8 ft. in back of cab. You can purchase unit separately and mount on your own chassis.
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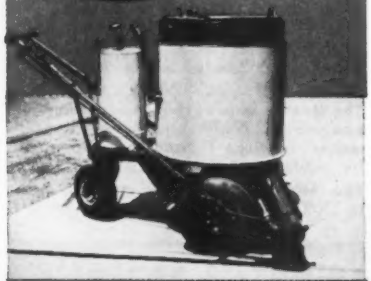
This recently developed portable kettle is ideally suited to prepare the small amounts of Flintseal necessary for sealing industrial floors, steps, stadia, swimming pools, driveways, roofs and the like.



A special shoe to fit and wipe the joint means that you'll get a clean, neat job with this type pouring pot. Circulating hot oil bath in the jacketed kettle keeps [illegible] pouring temperature.

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time the mixture was spread. The spreader was attached to the rear of the mixer by two 10-ft. cables, and similarly attached to the spreader was a Johnson float with steel grader blades which struck off the mixed material to a depth allowing 1½" for compaction.

The material was then compacted by means of a 12-ton 3-wheel Buffalo-Springfield roller, producing 95% or more relative compaction. The roller towed behind it a weighted V-type grader-cutter, riding on the side forms, which left the surface within 0.01 ft. of the desired grade. Immediately after this, surface compaction was completed by means of a Buffalo-Springfield roller in which the steel roller wheels had been replaced by 3 heavy truck wheels and tires in front and 4 behind. The surface was at once covered with a curing seal of liquid asphalt SC-6 emulsion, 0.1 gal. per sq. yd. Not more than one hour elapsed between the starting of compaction and the completion of finish rolling.

W. V. Brady—"Firm Foundation: Ingenuity Displayed on Santa Ana Freeway"; *California Highways*, March-April.

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Crushing Stone for Highway Surfaces. By *John C. Burnham*, Asst. Engr., Maine State H'way Dept. April, Pp. 94-95.


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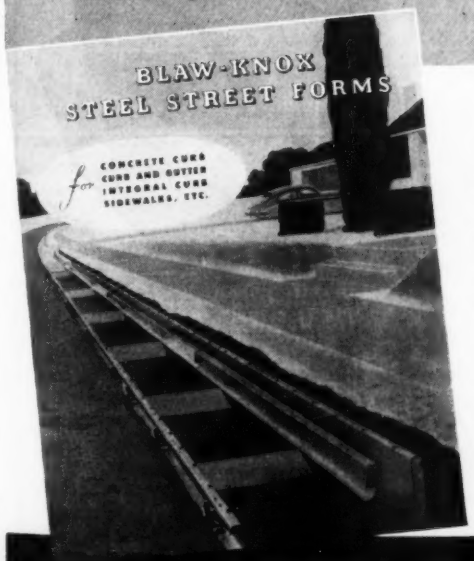


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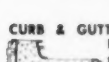
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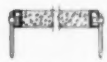
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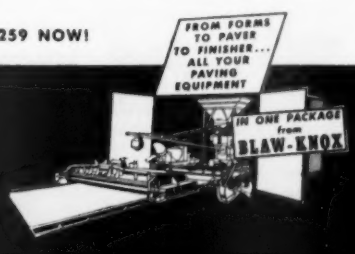



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## Consulting Engineers

*(Continued from page 44)*

water treatment plants for Marietta, O., and for New Concord, O. **J. Stephen Watkins,** Lexington, Ky., is working on water works improvements for Clarkesville, Tenn. **George E. Wells, Inc.,** St. Louis, Mo., is handling the program of water works improvements for Valley Park, Mo. **Emerson D. Wertz & Associates,** Bryan, O., have recently called for bids on a complete new water works project for Bettsville, O., to cost about $109,000.

### *Airports, Highways, Streets and Bridges*

**M. E. Chamberlin,** Montevideo, Minn., is planning airfield improvements for Montevideo. Improvements to the Santa Fe, N. M., municipal airport are being made under the direction of **Herkenhoff & Turney,** Consulting Engrs., Santa Fe. **Knappen Tippets Abbett Engr. Co.,** N. Y., have started work on the design of two bascule bridges over the Miami River, Dade Co., Fla.; the estimated cost is $1,000,000. This firm is also engaged on a paving project for the city of Philadelphia. **Sigler, Clark & Winston,** Weslaco, Tex., recently let bids for a bridge for McAllen, Tex., and for a sewer system for Mercedes, Tex. This firm has under way a sewage lift station for McAllen, a relift station for Brownsville, and two highway bridges for Brooks Co.

**Crenshaw & Jost,** Pekin, Ill., are about to let contracts for asphalt resurfacing, concrete pavement and sanitary sewers for East Peoria, Ill. **McGhie & Armstrong,** Rochester, Minn., are engineers for drainage work for Dodge and Steele counties, Minn., for airport grading for Dodge Center, and for street work for Houston, Minn. **Earle F. Miles,** Cuero, Tex., is handling drainage and street improvement work for Cuero, Tex. **L. P. Pelishek Engrg. Co.,** Clintonville, Wisc., is handling paving and curb and gutter for New London, Wisc., an outfall sewer and curb and gutter for Clintonville, and an athletic field and water main extensions for Marion. **Servis & Van Doren,** Hays, Kans., are engineers for 25 blocks of hot mix street paving for Ellis, Kans.

### *Power Installations*

A 3000 kw steam power plant for Iola, Kans., will soon be let by **Brink-Dunwoody-Cooper,** Iola. **Burns & McDonnell Engrg. Co.,** Kansas City, Mo., are designing a 30,000 kw plant for Kansas City, Kans., and a 40,000 kw plant for Austin, Tex. **Pfeifer & Schultz,** Minneapolis, Minn., are about ready to call for bids on a dual fuel diesel generating plant for the Federated Electric Assn., Jackson, Minn. **Reynolds, Smith & Hills,** Jacksonville, Fla., have taken bids on 22,500 kw plant for Tallahassee.

### Changes in "Local Climate" Due to Road Construction

A cut or a fill resulting from highway construction creates land surface conditions different from those normal for the locality, by modifying wind velocity, soil and air temperatures, and evaporation. Recognition of these changed conditions and their effects is extremely important in planning roadside development. For example, conditions on the north and on the south slopes of a cut differ from each other and from those of the original surface, which difference may greatly affect the development of vegetative cover. Maximum soil temperatures of 130° to 150° have been recorded at the depth of 1" on bare and dry south-facing banks, as compared to 80° to 90° on the opposite north-facing ones, and requirements for success-


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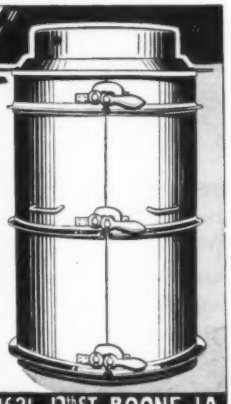

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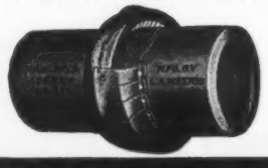

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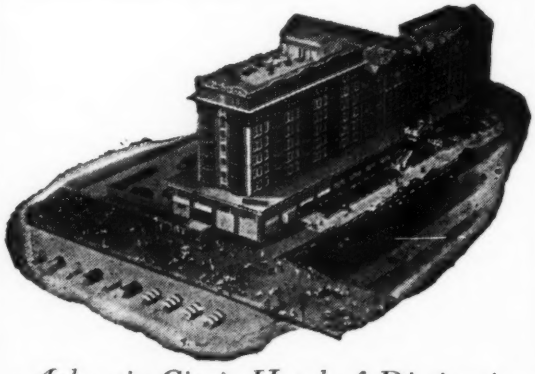

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ful revegetation of the two banks are quite different.

Repeated freezing and thawing, with accompanying frost heaving due to the formation of ice crystals, is the principal cause of instability on bare soil. In the frost belt of the United States, alternate freezing and thawing of exposed soil occurs fifty or more times during a single winter. Frost action is most severe on moist south facing slopes, where it will account for the erosion of one foot of soil from a 1-1 sloping clay bank in a single winter season.

The development of mulching technics is a direct effort to overcome the unusual climatic stress to which newly exposed soil areas are subjected. For this reason mulching should be adapted to meet the requirements of a particular location where it is to be employed. Mulching is most required on the upper slopes of dry steep banks, subjected to extreme desiccation by wind and exposure to the sun. Low banks of rich moist soil may need little or no mulching. On the other hand, mulches are valuable wherever soil structure and soil fertility levels are extremely low and where the moisture retention power of the soil is lacking. This is frequently the case whenever a large amount of soil has been disturbed by road grading.

In a paper before the Highway Research Board, from which the above is abstracted, Charles R. Hursh, of the U. S. Forest Service, discussed at length the importance of considering these matters in roadside design and development.

### Rodent Barrier as a Highway Appurtenance

A rodent barrier was included in the contract for a recently completed highway job in California. Behind this unusual provision lies a minor footnote of history. Construction some years ago of an underpass on this same road involved lowering the grade across an alfalfa field. When the owner of this field flooded it, the water found its way through gopher holes to the slopes of the underpass and flooded it so deeply that highway traffic had to be rerouted. The owner was threatened with legal action if there were a recurrence of the incident. The recent job referred to included construction of another underpass on the land of the same owner, and the construction of the rodent barrier was the result of right-of-way negotiations. The barrier consisted of sheets of 16-gauge corrugated sheet iron extending 5′4″ below the surface and 5½″ above it.

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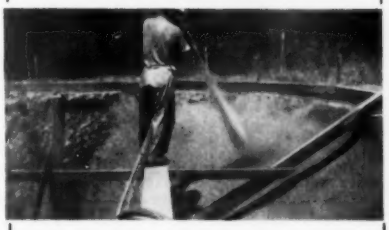

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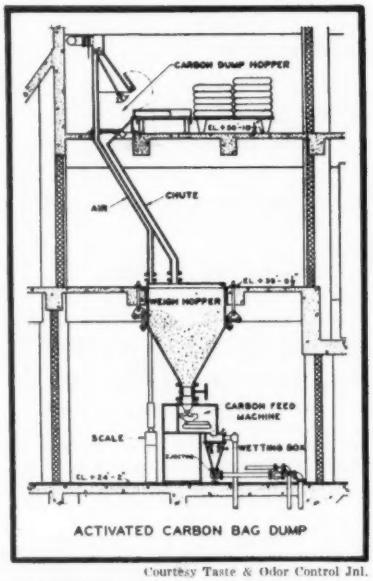
# THE WATER WORKS DIGEST

### Taste and Odor Removal at Chicago

During the past 20 yr. an important feature of the treatment of the lake water at Chicago's South District filtration plant has been the removal of taste and odor. Every known method has been tried. By 1936 powdered carbon seemed to be the most promising solution and equipment for its use was incorporated in the new plant, construction of which began in 1938 and is now about 97% completed. It provides filtration for over 600 mgd.

During 1948, 1404 tons of activated carbon were used in treating 116,828 m.g. of water, an average of 24 lb. per m.g. A peak dosage occurred in February, when, during three days, it ranged from 194 to 262 lb. per m.g., the maximum threshold odor reaching 80, chiefly due to oil refinery waste. The month of peak usage was August—48.8 lb. per m.g., due chiefly to algae. A brief peak, due to a slug of oil refinery waste, occurred on Dec. 5th, when the odor threshold increased from 4 to 80 within 5 hr., then decreased to 3 within 5 hr., and a maximum of 486 lb. per m.g. was reached. The average dosage for the year for each odor threshold reduction was 8.6 lb. per m.g.

At present the carbon is received in 35-lb. paper bags, but means of handling it in bulk are being studied. The equipment for applying the carbon is shown by the accompanying illustration of one of the nine units. The carbon is emptied from a bag in a ventilated dumping hood into a chute from which it drops into a weigh hopper, 6 x 6 ft. at the top and 1 sq. ft. at the bottom, connected to the chute above and the gate valve at the bottom with flexible sleeves of heavy canvas; also with an air chute which removes the dust from the dumping hood and the weigh hopper, and discharges it into a dust collector. The weigh hoppers are supported on scales that hang from beams on each side of the hopper. The carbon is fed through 9 dry-feed gravimetric machines, which drop it into wetting boxes, where a spray of water keeps it moving to an ejector which further dilutes it and forces it through piping to the points of application—some of them 600 ft. distant. Dry feeding has presented some difficulties, and a method of handling it as a slurry is being investigated.




Courtesy Taste & Odor Control Jnl.

***EQUIPMENT for handling activated carbon, used for taste and odor control at the Chicago plant.***

John R. Baylis—"Taste and Odor Removal at Chicago's South District Filtration Plant;" *Taste and Odor Control Journal*, May.

### Controlling Aquatic Growths

In the fall of 1947 about 700 acres of the 2400-acre Sheldon reservoir of Houston, Tex. was covered with aquatic growths; and they were numerous in the canal between it and the pumping plant, reducing the effective flow capacity from 40 mgd to 25. In September the reservoir was sprayed with the triethanolamine salt of 2,4-D in aqueous solution, at the rate of 1 lb. per acre. This gave approximately 80% effective kill of surface and emergent plants. The canal was hand sprayed with a much higher dose, but this was only 50% effective, and plane spraying of this later gave 80% efficiency. No toxic effects to fish or livestock have been observed.

In 1948 another area was sprayed, and effort was made to kill submerged plants as the reservoir surface fell and exposed them. Cattail was resistant to 2,4-D and various weed killers were tried, the most effective being Dow Contact Herbicide, followed by an ester preparation of 2,4-D on the young growth. For briars, Esteron 245 was more effective, and was also satisfactory for the majority of aquatic growths.

Clyde R. Harvill—"Aerial Spraying Controls Reservoir Growths"; PUBLIC WORKS, May.

### Reservoir Under City Street

Santa Monica, Calif., wished to increase its water storage capacity by 10 mg, but space on an ideal hill-top situation could be found for only a 5 mg reservoir. At a similar elevation there was a street with a 130 ft. right-of-way, the middle 50 ft. of which had been occupied by an electric railway which had dropped its franchise, and this 50 ft. has been utilized for an underground reservoir 50 ft. wide by 29 ft. deep and 660 ft. long. (The length can be extended later should additional storage be desired.) This reservoir will be a reinforced concrete box, with bottom and wall slabs 2 ft. thick; and a top slab 11" thick, supported by 64 columns and covered with 3 to 4½ ft. of earth which will be landscaped. The 40 ft. on each side of the reservoir will be paved.

"Boulevard Covers City Water Reservoir;" *Engineering News-Record*, May 5.

### Labor-Management Relations in Water Utilities

Three of the most important steps in a well managed employment system are careful selection of personnel, placement, and on-the-job training. . . . Individual recognition, not wages, is the most important factor in good personnel relations.

. . . Every utility should set up grievance machinery. . . . The greatest cause of dissatisfaction with wages is the feeling of employees that others are getting better pay for doing the same work. . . . Emphasis should be given to the opportunities each employee has to advance if he will apply himself diligently and improve himself by further training.

Striking against the government undoubtedly will be held illegal, for reasons that are almost equally valid for private utilities such as water works. Public officials are not required to recognize a union or sign a contract; but it is generally accepted as sound policy to permit employees to join a union which is not Communist-dominated. However, any employee forfeits his right of employment who advocates, or who joins an organization which advocates, the overthrow of the government by force or violence.

Thomas F. Neblett—"Labor-Management Relations in Water Utilities;" *Am. W. W. Ass'n Jour.*, April.

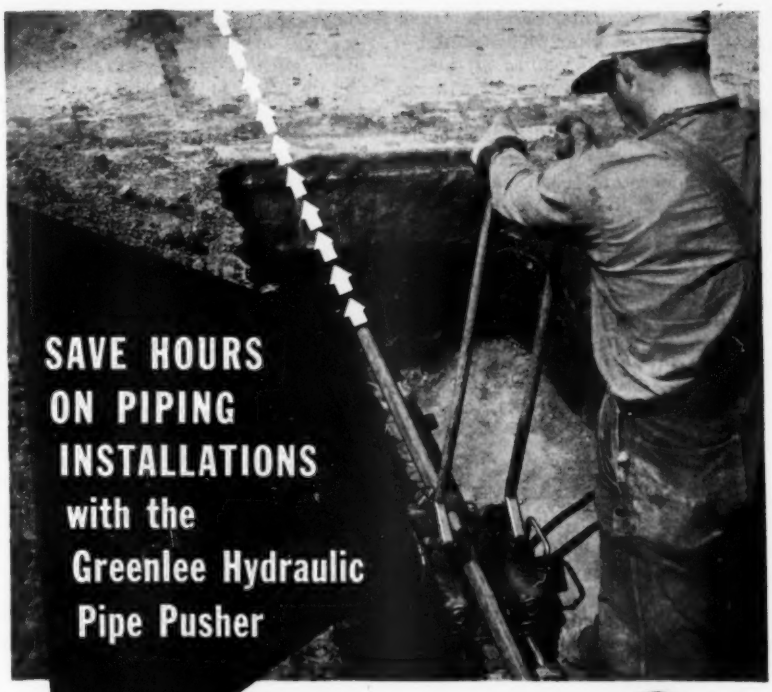
### Synthetic Detergents

Soaps and synthetic detergents are similar chemical compounds, but the calcium, magnesium and heavy-metal salts of the soap acids are highly insoluble and the soap acids themselves are insoluble in acid solutions. Synthetic detergents have the overall desirable advantages of forming soluble salts and of being effective in cold water and at a neutral pH. Either may be more effective for specific purposes and in particular waters. There is no soap or synthetic detergent which is superior for all domestic purposes in all waters. Improved synthetic detergents have superseded and will continue to supersede soaps for many purposes. Nevertheless, the advantages of soft water are so many and varied that, even if the argument in favor of softening water, that it would save soap, should become obsolete (as a result of improved and cheaper synthetic detergents), it is highly doubtful that the soft water industry could be bothered.

T. E. Larson—"Synthetic Detergents;" *Am. W. W. Ass'n Jour.*, April.

### Philadelphia's Ozonation Plant

At the Belmont filter plant of the Philadelphia water works there went into operation on March 14th by far the largest ozonation plant ever designed for use in the United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States. Tests made had indicated that this water, after 20-hr. presedimentation, would require an average of 1.6 ppm of ozone, with a maximum not exceeding 4 ppm, and the latter was adopted as the basis for designing. The plant contains 50 ozone generators, each capable of producing 25 lb. of ozone per 24 hr. To produce this, 1,500,000 to 3,000,000 cu. ft. per day of air must be circulated through the generators, all of which must first be dried and all dirt removed. The air is cleaned by passing it through an electrostatic air filter, and all moisture removed by passing it through refrigerative and adsorptive driers. It then goes to the generator units where 0.5% to 1.0% of the weight of the air is converted to ozone. The ozonated air goes to diffusion tanks and is introduced at the bottom of them through porous plates and rises through 18½ ft. depth of water. The tanks are of such size as to give better than 10 min. detention to 36 mgd. of water, which enters over weirs at one side of the tank and leaves through outlets under the wall at the apposite side. Cooling water, taken from the high-service line at the pumping station, is used by the adsorptive driers and refrigerative units at rates which may reach 1 mgd. Instruments record the flow of treated and cooling water, the air flow, the air and water temperature in headers supplying generator units, the dewpoint of the air after drying, and the amount of current used. It is planned to record and study data on the concentration of ozone produced, the poundage produced with different air flows, current used and other factors, in order to determine the most efficient generation and the most practical and economical operation procedures.

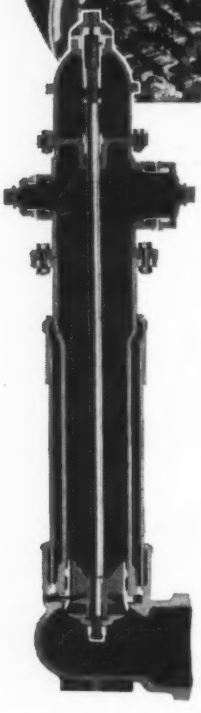
Elbert J. Taylor — "Philadelphia Ozonation Plant;" *Am. W. W. Ass'n Jour.*, April

### Free Residual Chlorination Experiences

At Valparaiso, Ind., lake water is dosed with chlorine and alum, pumped into an aerator, and lime and carbon added when tastes and odors are present. It is then mixed for 30 min. and flows into a settling basin. This basin gives only 30 min. detention, which greatly increases the difficulty of adequate treatment, and it is proposed to increase the settling time to 4 hr. The basin effluent is filtered and distributed through 29 mi. of mains; the fact that 10 mi. of these are wood pipe being another source of difficulty.

In May, 1946, distribution system samples showed no residual chlorine although 0.45 ppm was maintained at the pumping station; and even when the dosage was increased to the full capacity of the chlorinators —2.4 ppm for prechlorination and 1.4 ppm for post—residual disappeared from the water in less than an hour. The chlorine demand of the raw water was found to be 11.25 ppm, due to weed growths in the lake. Then breakpoint chlorination was begun. For 24 hr. a residual of 3.0 ppm applied to the filters was reduced to 0.45 ppm in passing through them, but after this there was no loss of chlorine in the filters. Still there was only a trace of combined available chlorine in a large part of the distribution system. (It was established that the wood pipe absorbed chlorine at a very high rate.) Free available chlorine residual treatment was then begun and has been maintained for two years, the maximum monthly average application being 12.7 ppm and the average 9 ppm, and the result has been satisfactory.

Taste and odor is a serious problem during the spring and fall



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overturns in the lake, and, because of the short sedimentation period, activated carbon can not be applied in sufficient amounts. It was found that where free available chlorine residuals existed the number of complaints was much smaller than where it did not. However, some tastes persisted, but it is believed that with larger basins, when heavier doses of carbon can be applied, free residual chlorination will reduce tastes and odors to a minimum.

Richard H. Coote—Valparaiso Experiences With Free Residual Chlorination;" *Am. W. W. Ass'n Jour.*, April.

Indianapolis, Ind., since 1946 has used the free residual chlorine process for treating its supply. This requires 3 to 5 times as much chlorine as was used previously for maintaining a combined available chlorine residual, and larger chlorinators. Among factors compensating for this extra cost are a reduction in the amount of coagulant required, from 21 ppm to 15 ppm; need for taste and odor treatment is eliminated—the chlorine treatment even removes the coal-tar odor due to gas plant wastes. Slime growths and biologic deposits have been eliminated from filter sand and gravel, and the former practice of removing and cleaning these at 2-yr. intervals is no longer necessary. The control of free residual chlorination is obviously more difficult than the control of combined residual chlorination, but it is considered at Indianapolis that the advantages considerably outweigh the disadvantages.

Marshall P. Crabill—Indianapolis Experience With Free Residual Chlorination, *Am. W. W. Ass'n Jour.*, April.

### Proposed Rate Schedule

The Michigan Section's Committee on Water Rates has agreed on "some logical rules for rate making which may prove to be constructive" but "lead to modifications in certain established theories and practices in rate making." It largely discards the theory of the "readiness-to-serve" or "capacity" or "demand" charge, believing that outside of the fire charge there apears to be no method for equitably measuring and allocating to customers readiness-to-serve costs arising out of peak use of water. It also discards the capacity ratio theory of meters for apportioning such charge as not affording a fair approximation to equity. The committee proposes as a fire charge that percentage of


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the total fixed charges which the fire demand bears to the total demand. Instead of a readiness-to-serve charge it proposes a service charge, including cost of service pipes, meters, meter reading, billing and collecting, and a minimum service of about 100 gpd per meter. It proposes three commodity steps—a wholesale unit rate, intermediate unit rate, and domestic unit rate. The wholesale unit rate is obtained by dividing the total of all production and transmission expense, plus a portion of administrative expense and overhead, by the total annual pumpage. The intermediate rate is obtained by adding to the wholesale rate an increment obtained by dividing the total expense arising out of distribution mains larger than 6" by the water sold through all meters except sales at the wholesale rate. The domestic rate is obtained by adding to the intermediate an increment obtained by dividing the total expense arising out of distribution mains 6" and smaller plus the cost of all lost water, by the water sold through all meters ¾ in. and smaller.

"Proposed Water Rate Schedule"; *Journal Am. W. W. Ass'n*, March.


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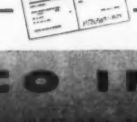

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## Painting Water Tanks

In painting its four elevated tanks, Milwaukee has tried two systems—two-coat jobs, consisting of one coat of inhibitive primer and one coat of aluminum, and a one-coat job at shorter intervals. They concluded that the latter was no more expensive and the appearance of the tank was better because of the more frequent painting. For the last ten years they have followed a regular program of painting one of the four tanks each year with one coat of aluminum. Since 1935 they have used, for interior painting, a non-drying paint (really a type of grease). Tanks so treated are still in excellent condition.

L. A. Smith—"Maintenance of Water Tanks;" *The Municipality* (publication of League of Wisconsin Municipalities), April.

## Cleaning a 60-Inch Main

Newark, N. J., has just cleaned about six miles of 60" riveted steel main which was laid 47 years ago. The work was done with a "National" pipe cleaning machine and was perhaps unusual in only one feature—the disposal of the waste water. The pipe lies in the main street of Montclair and Bloomfield. It required a flow of water at the rate of 40 mgd to push the machine through the pipe, and there was no sewer capable of carrying away this flow. It was therefore discharged into an adjacent stream. To reach this, it flowed across the street in a volume sufficient to stop traffic, including the trolley cars that used the street. The cleaning was done at night, and arrangement made with the trolley company whereby it stopped its cars several hundred feet each side of the discharge and transferred the passengers from one side to the other by means of buses which detoured through other streets.

Laurie M. Leedom — "Newark Cleans and Lines 60-Inch Water Main"; *American City*, May.

## Installing Services In Indianapolis, Ind.

The Indianapolis Water Co. provides water through 96,000 active services. The company installs the tap and meter, which remains its property. Services must be laid 54" deep and be at least ¾" size. In installing 1½" taps on 4" or 6" mains, or 2" taps on 4", 6" or 8" mains, they are inserted in a mechanical jointed split sleeve. For inserting taps 1½" or larger, the tapping machine is

powered by a close-quarter reversible air drill. Customers are required to furnish adequate frost protection for meters. Billing for meter damage did not insure this, and now when a meter is damaged by frost the service is disconnected until the faulty condition has been corrected. In order to advise the customer as to desirable size of meter where the anticipated flow cannot be determined, a trial meter is set and a flow rate record made of the actual use. Of the 96,000 meters, only 2.8% are larger than ⅝". Service maintenance trucks are 1½-ton units with power take-offs to drive 105-cf air compressors. They are equipped with mobile radio telephones rented from the local telephone company, which operate the truck's horn to call the foreman if he is not in the truck cab.

H. W. Niemeyer — "Tapping and Meter Setting Practices in Indianapolis"; *Water Works Engineering*, March.

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Synthetic Detergents. By *T. E. Larson*, Ill. State Water Survey Div. April, Pp. 315-321.

Philadelphia Ozonation Plant. By *Elbert J. Taylor*, Chief, Bureau of Water. April, Pp. 322-330.

Installation and Maintenance of Gate Valves. By *Max K. Socha*, Eng. of Water Water Distr., Los Angeles. April, Pp. 331-336.

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Boulevard Covers City Water Reservoir (in Santa Monica, Calif.). May 5, Pp. 20-31.

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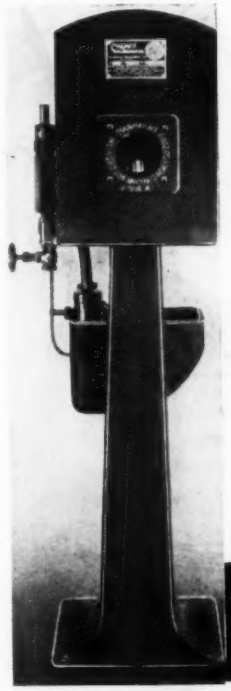

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### *Public Works*

Aerial Spraying Controls Reservoir Growths. May, Pp. 23-24.
Water Hammer and How to Control It. By *Philip S. Davy*, Davy Eng. Co. May, Pp. 30-31.
Water Chemistry and Chemicals. A complete text. May, Pp. 50-54, 56, 59, 60, 62, 64, 67, 68, 70, 72-79.

### *Taste and Odor Control Journal*

Taste and Odor Removal at Chicago's South District Filtration Plant. By *John R. Baylis*, Engineer of Water Purification. May, Pp. 1-12.

### *Technique Sanitaire et Municipale (France)*

Les Equilibres Acide Carbonique-Carbonates: Nouvelle Representation Graphique. By *J. Hallopeau*, Civil Engineer of Mines. Jan.-Feb., Pp. 1-11.

### *Water Works Engineering*

Telling the Water Supply Story to the Consumers. By *H. B. Fisher*, Ass't to Gen'l Mgr., East Bay Mun. Utility Dist. April, Pp. 294-296, 335.
Puerto Rico's $40,000,000 Water Supply and Sanitation System. April, Pp. 297-298.
Water for Tocopilla, Chile, Was Not Easily Obtained. By *Arthur T. Cook*. April, Pp. 300, 330.
Marketing of Timber Increases Runoff from N. C. Watershed. April, P. 303.
Serving a Safe Supply. By *Angus D. Henderson*, Civ. Engr., Dept. of Water Supply, New York City. April, Pp. 308, 332.
Cracked Valve Leak is Stopped by Using Inside Rubber Gasket. By *John B. Ogden*, Ass't Supt., Passaic Valley Water Com'n. April, Pp. 309, 331.
Break in Single Supply Line at Taunton, Mass., Causes Trouble. April, Pp. 310, 328.

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### Built-in Highway Safety

For each type of road accident there is a practical remedy, said Charles M. Upham recently, and he specified a few. "Head-on collisions," said he," can be prevented by separating the traffic streams by a center strip. The broader this median is, the better, since it then helps eliminate the headlight hazard at night. Intersectional collisions can be prevented by grade separations. Grade separations will also prevent collisions at railroad crossings. To keep drivers from running off the road, longer sight distances and easier curves are the remedies recommended. Broad, firm shoulders, wide pavements and guard rails all contribute materially to keeping cars on the road and out of danger. Safety engineering also considers the hazard of the pedestrian. Limiting access helps keep pedestrians off the highway. But sidewalks and footpaths will do much to relieve a dangerous situation. Desirable also are elimination of narrow pavements, high crowns, sharp curves, steep grades, slippery surfaces, limited views and similar hazardous road conditions."

## Equipment for Applying Insecticides

*(Continued from page 37)*

for use in cities and towns has made it widely useful. When dry fog is applied properly and the correct insecticide and solvents used, visible residues will not be formed on most surfaces. This is important in and around buildings where complaint may occur if improper application of material causes staining or the appearance of physical deterioration.

Fog can be used on garbage dumps —generally jeeps maneuver more readily in these areas — garbage scows, in mosquito and fly control, around streams, picnic areas, beaches and other public places.

To reduce fly and insect populations, which are disease carriers, some communities fog the interior and exterior equipment used for collecting refuse and garbage weekly. In addition, fog generators are helpful in controlling insects infesting sewers. When used for this purpose, all manholes should be covered except the one at the end of the area to be fogged—the most distant from the machine—in order to allow draft and to check penetrating action of the fog.

The crew required may be one or two men. With slight improvisation,

one man can act as both driver and operator. For outdoor work in sparsely settled areas, an extension attached to the insecticide shut-off valve permits operation by the driver. In densely populated areas. a second man is required to act as a lookout for traffic and pedestrians. The insecticide storage capacity, depending on the vehicle used, generally ranges from 30 to 110 gallons or more and the rate of usage for a dry fog is 20 gallons per hour at 6 miles per hour.

### *Sprayers and Dusters*

The pack sprayer, an inexpensive hand-operated unit, serves as an important adjunct in a complete program. The sprayer consists of a steel or galvanized iron container holding from 1½ to 5 gallons of liquid, with hose attachments for applying sprays. Some sprayers have pressure gauges while others require operation of a plunger to obtain the correct operating pressure Interchangeable nozzles vary the gallonage output per unit of time, and the shape and type of spray.

Pack sprayers can be used on banks of streams, in fly and mosquito breeding areas, along roads and paths, and for placing a heavy concentration of insecticides in a specific insect-breeding area. While the larger dispersing units can handle most of the program, pack sprayers and hand dusters serve as effective auxiliaries in follow-up operations.

Hand dusters have limited use, mainly in hard-to-reach places where sprays do not deposit a sufficient amount of residue. They are inexpensive and are operated by one man. The principles involved may vary and include rotary blower or straight push-type plungers. Either wettable or dispersible powders can be satisfactorily applied with this unit.

Hydraulic pressure sprayers are widely used for larvacidal work. The important part that they formerly played in tree and insect spraying has diminished but they still remain an important phase of the insect control program.

At some time in the future the Hession Microsol Unit #403 will be available for large scale outdoor use. This is an enlargement of an indoor space sprayer based on the principle of having two oppositely revolving plates close together with a stream of insecticide injected between them. Centrifugal force breaks the insecticide into a fine particle size and as it passes the outer limits of the plates a strong blower pushes the fine mist out of the unit at high speeds. Particle size and insecticide consumption can be adjusted. The large scale outdoor model is currently being revised and full details will be available at a later date.

Manufacturers of application equipment include:

**Helicopter-Fog:** Bell Aircraft Corp., Buffalo, New York.

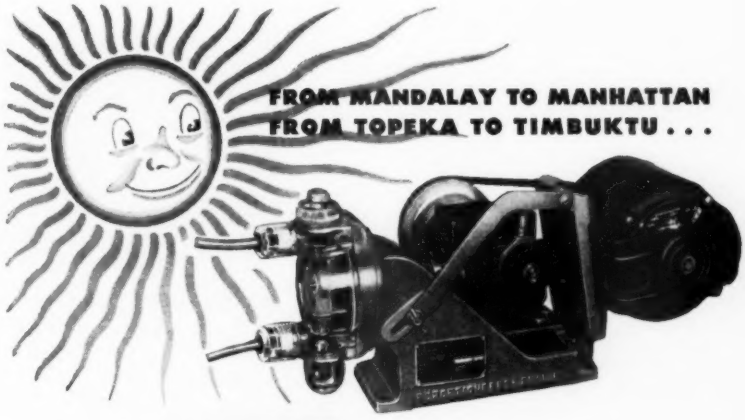
**Mist-Blowers:** Lawrence Aeromist Co., 58 Federal Street, Greenfield, Mass., A. B. Farquhar Co., 3522 Duke Street, York, Pa.

**Aerosol Generators:** Todd Shipyards Corp., Combustion Equipment Division, 81-16 45th Avenue, Elmhurst, L. I.

**Microsol Units:** Silver Creek Precision Corp., Silver Creek, N. Y.

**Hydraulic Sprayers:** Essick Mfg. Co., 422-24 Court Ave., Des Moines, Iowa; John Bean, Lansing 4, Michigan; H. D Hudson Mfg. Co., 589 E. Illinois St., Chicago, Ill.; Buffalo Turbine Co. Inc., Gowanda, N. Y.

**Hand Sprayers & Dusters:** D. B. Smith & Co., Utica 2, N. Y.; H. D. Hudson Mfg. Co., 589 E. Illinois St., Chicago, Illinois.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# County-Operated Quarry Cuts Maintenance Costs

WHITE COUNTY, Arkansas, has cut its costs for road material in half by re-opening an abandoned quarry and producing its own crushed stone. The county installed modern crushing equipment at old Bee Rock Quarry, on the bank of the Little Red River near Searcy, last May, in an attempt to obtain cheaper material. This quarry, except for a brief period in World War I, had not been operated for some 80 years.

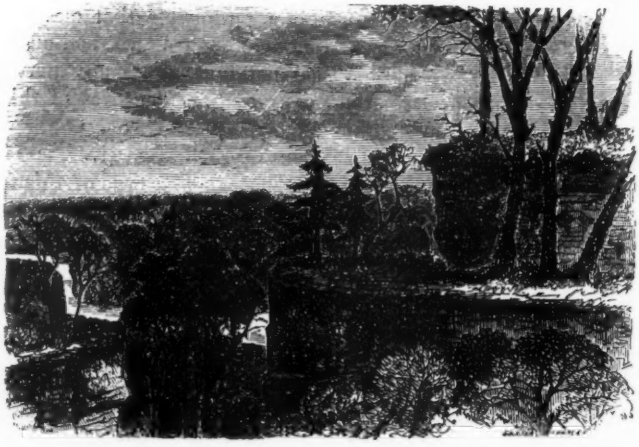
In the past, the improvement of county roads was retarded by the high cost of crushed stone, which was trucked in 60 miles from Little Rock. Up to May of last year, only 350 of 3,500 miles of county road were surfaced with gravel or stone.

As a result of successful operations at the re-opened quarry, White County will be able to speed-up its road repairing and surfacing program. Formerly, it cost approximately $3 overall to put a ton of stone on the road. With the quarry in operation the cost is only $2.00 per 2,700-pound yard, or $1.48 per ton—slightly less than half. Crushed stone is sold to the State Highway Department and to local contractors.

Pioneer "Continuflo" equipment is used at Bee Rock Quarry. Primary unit is a jaw crusher, operated by a 100 hp. International UD-18 Diesel engine. This reduces the stone to 3-inch size. The secondary unit, which reduces the 3-inch stone to 1½-inch, is a roll-type crusher driven by a 125-hp. International UD-18A. A third diesel, an International UD-6 of 40 hp., operates the screen.

During the period of May to December, 1948, the quarry produced 24,000 yards of crushed stone, an average of 170 yards per day. The average production was considerably lower than had been expected, because the local stone proved very hard. It had to be fed to the crusher in very large pieces—some almost mansize—which caused difficulties in handling and slowed operations.

By developing more efficient methods, the rate of production was increased. The plant was producing from 300 to 400 yards per day of 1½-inch stone by December.



● ***WOODCUT published in 1858 showing the cliffs of "Bee Rock," now being used for road material.***

● ***QUARRY VIEW, showing crusher in background. Trucks are shown feeding crusher and hauling out the crushed sandstone aggregate.***

# *Getting Roads Ready for* WINTER

**F. RAY WILLIAMS**
**County Highway Superintendent, Saratoga Springs, N. Y.**

IN OUR wintertime maintenance, we have found a serious need for wider shoulders and wider bank slopes to provide a place to put the snow during winter plowing operations. While our anticipated snowfall is approximately 90 inches per year, we had during the past (1947-1948) winter 117½ inches, most of which remained on the ground without settling during the entire winter. It can readily be seen that we had high snowbanks along all of our roads. Moreover, nearly the entire area of this county is subject to high winds during the winter period, causing a considerable amount of drifting in all highways. It is necessary that we not only plow pavements, but that we plow at least a 3-foot width on our shoulders throughout the fore part of the winter, in order that we have that additional width to serve as a place to put the snow later on, when our snowbanks are so high that the wings on our snowplows will no longer carry the snow to the top of the bank.

### *A Better Highway Section*

Having this in mind, as well as a desire to build safer highways for the traveling public, I devised a new highway section which we are using at this time in reconstructing our old and worn out county roads. This section provides for an 18-foot pavement and 6-foot shoulders. From the break of the shoulders, it provides for a 4-foot width wtih a slope of 1 on 4 to a ditch 12 inches in width. The back slopes are 1 on 1½ in fill and 1 on 2 in cut.

This, of course, necessitates some additional excavation and the purchase of some additional land for right of way. However, we find that the additional land required costs very little, if any, more than the land that would be needed for our original typical section. The new section gives plenty of room for snow during our snow plowing operations. Coupled with this, our banks are laid back, and our sight distance improved. In our design we attempt to obtain, in new alignment, curves not less than a thousand foot radius and we flatten grades to such an extent that we have a sight distance at all points on our new highways of 1000 to 2000 ft.

### *Roads Completed Recently*

We have several jobs which we have completed this year. One is the road leading from the Spa development at the Geysers to the Ballston Airport, a distance of about 3.1 miles. The pavement is 18 feet in width and consists of a 2" penetration method bituminous macadam pavement on 9" of compacted gravel base which was primed with one-third of a gallon per square yard of Tarvia B.

Many of our older County roads were built in the years when our Board of Supervisors were not convinced of the wisdom of buying the necessary right of way for a good alignment. Therefore, they generally followed the old roadway. With the advance in motor design and the speed with which people desire to travel, these highways have become outmoded and dangerous and we are now engaged in rebuilding many of our older roads. We have followed a program of reconstruction since the war, and have at this time about forty miles of such old roads rebuilt, with good alignment, easy grades and long sight distance. This design is proving out very satisfactorily and we are getting favorable comments from the traveling public. These roads are costing us approximately $25,000 per mile. They are the feeder roads to the State system over which flows a considerable amount of traffic, together with the school buses and the necessary other business traffic of various communities.

There are approximately 345 miles of improved roads in our County road system, most of which are bituminous macadam. Some of these County roads, while they are "low cost," have been serving very heavy traffic, particularly in the summer resort areas. The traffic count a few years ago on one of these roads, 16 feet in width, showed an average daily weighted traffic for twelve hours of 3800 cars. This is considerably more traffic than we find on two-thirds of the State highway system.

***THE SARATOGA road section showing wide shoulders to give room for snow plowing operations.***

● ***THE KIND OF SNOW that requires space for disposal, and advance planning if roads are to be kept safe for travel.***

### A Century of Public Health Legislation

On November 5-20 there was held in London a "Public Health and Municipal Engineering Congress" in which 25 associations and organizations participated in celebrating the 100th anniversary of England's Public Health Act. This act was passed and a general Board of Health created in 1848, with Sir Robert Rawlinson as the first chief. He developed a complete system of water-borne sewerage for towns. Fifty years later a Royal Commission was appointed, which revolutionized sewage treatment methods. In 1901 the Association of Managers of Sewage Disposal Works was founded, evolving into the Institute of Sewage Purification.

### Cost of Operating Municipal Asphalt Plant

The San Francisco, Calif. municipal asphalt plant, during the year ending June 30, 1948, produced 30,888 tons of asphaltic mix at a cost per ton of $3.66 for labor and materials. Excluding the time that the plant was shut down, the average cost of production would be $3.52 per ton.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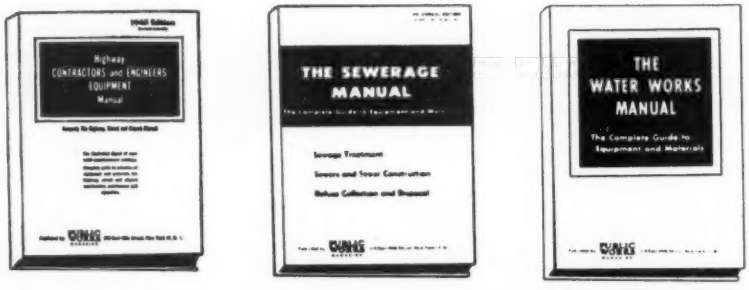


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## Water Safety Practices

*(Continued from page 38)*

school symbols and football scores on the tank, for all to see—especially the opposition.

2. Fenced-in transformers, unless roofed over with a fine screen provide an ever-present safety hazard when adjacent to a baseball field.
3. Poles, which may carry high-tension wires and transformers are always potential challenges for climbing.

### *Needs of a Safety Program*

Fundamentally carelessness and heedlessness—whether of management or worker—result in accidents harmful to both worker and management. Therefore a safety program should be so designed as to promote freedom from danger or hazards by securing reduction in those accidents caused by carelessness or heedlessness by both management or worker.

Accidents due to poor lighting, bad human relations or inadequate enforcement of safety rules might well be classed as due to heedlessness of management.

Responsibility for safety rests with management—and that responsibility cannot be sloughed off onto the insurance company. Management—at all levels—must show a sincere interest in the safety program. It must by precept, action and example cooperate actively with the workers in the safety program. Management must have a continuing policy of showing the worker how to be careful. The active backing of the safety program by top management is essential. Without it any safety program is lost and meaningless.

Safety may result either from improving working conditions and processes or by improving human behavior. The means to these ends are correctives to remove hazards, controls to minimize exposure to hazards, and influences to encourage workers to avoid practices that are unsafe.

### *Prevention*

The first thought in any safety program is accident *prevention*. This involves four fundamental activities:

1. Removal of physical accident hazards (a function of management).
2. Study of processes and practices (a function of both management and worker).
3. Education to minimize human hazards (a function of the worker).
4. Investigation of every accident whether injuries result or not (a function of both the worker and management).

Summing up it is evident that accident prevention is practically a 50-50 proposition—i.e. cooperative effort — between management and worker.

An important phase of a safety program is accident investigations. A thorough program of such activities involves the following:

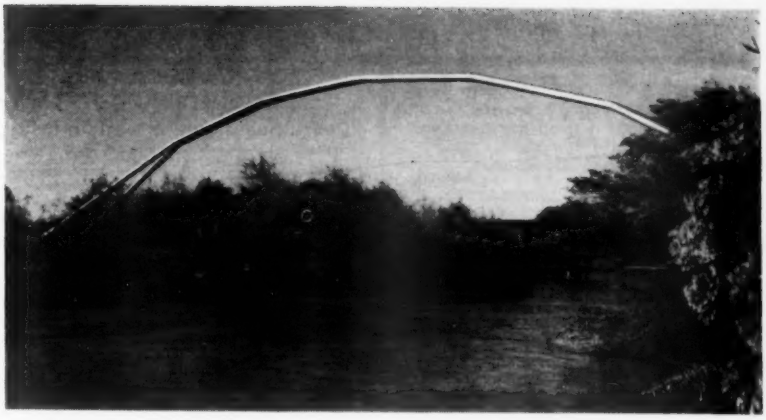
1. Investigation by at least two persons neither of whom is under the supervision of the head of the department in which the accident occurred. Obviously in a small organization this calls for an extremely diplomatic investigation.
2. The investigator should have a working knowledge of the equipment and processes involved in the accident. Consequently, the same investigators cannot cover adequately the entire field of the water utility. The safety director should be free to call on any worker, or supervisor, to act as an investigator.
3. The investigators should have good common sense and be capable of clear thinking to enable them to carry the investigation to a fair, unbiased conclusion with a definite recommendation.
4. Since an accident usually involves both a physical hazard and an unsafe act of human behavior, both should be weighed in the investigation.
5. Promptness is essential. Time dulls not only the physical aspects of the accident, but also the memory of those involved.

A thorough and complete record of investigation of every accident will build up a fund of information —case data, if you please—on accident prevention.

### *Outline of a Program*

Finally, what can and should we do in regard to a safety program in the water utility or other operating field? We should:

1. Organize our personnel for safety and discipline ourselves into safety consciousness.
2. Tighten up on our supervision for safety.
3. Provide protective equipment for the workers and school them in its use.
4. Correct known and obvious physical hazards in the system.
5. Develop practices that are safe. If this be done, enforcement of safe practices will be easier.
6. Educate the worker and instill in him a desire for safety. The water utility safety program should be coordinated with that of the gas, electric and telephone utilities in our city.



# PIPE

## over stream is self-supporting

ARTHUR ROHMAN

A SELF-SUPPORTING, all-welded arch construction pipe line stream crossing is part of Southern California's Gas Company's new Imperial Valley line. According to Elting Henderson, Manager of Distribution, this novel crossing is, so far as is known, the first of its type. It was designed by Company engineers to span the Alamo River between Calipatria and Brawley. It was constructed by connecting the 10″ mains on either side of the stream with two mutually supporting 6″ pipe lines. The arch proper is composed of five 10-foot sections of pipe, with the center of the arch approximately 25 feet above the water line of the 100-foot wide stream. The pipe lines forming the arch section proper are held in place by inverted Y pipe sections welded into 10-ft. headers on either side of the stream. These headers are well back from the high water mark on either side of the stream, and are made by welding a 12″ pipe section at right angles into the 10″ main line. The crossing section was welded on the job as a unit.

High velocity wind is the principal hazard but the two pipes buttressed against each other are designed to withstand wind velocities well in excess of any experienced in that area.

Compared to other types of stream crossings, either buried or of the suspension bridge type, construction costs were modest. The work required only a few days to complete by the regular construction crew with regular equipment.

---

### Pumping Grease Skimmings at Detroit

At the Detroit, Mich., sewage treatment plant, sticks in the grease skimmings presented a difficult problem for the small grease pumps and a larger size Scru-peller pump was substituted for one of them. This ground 99% of the sticks entering it, and, as a result, it was decided to replace all the original pumps.

### Fluoride Removal Plant

The fluoride removal plant at Britton, S. D., is now in operation, and the fluoride content of the water is being reduced from 7 ppm to 1 ppm. Removal of the fluoride is by adsorption in filter beds of specially prepared and highly reactive tricalcium phosphate, which is later reactivated with caustic soda. That portion of the caustic soda not removed by normal backwashing is neutralized by carbon dioxide gas.

This new plant was noted in the First Quarter issue of the "Clarifier," publication of the State Board of Health. The Britton plant was constructed in cooperation with the Public Health Service, as a research project, and careful record of plant operation will be kept in conjunction with studies of dental records.

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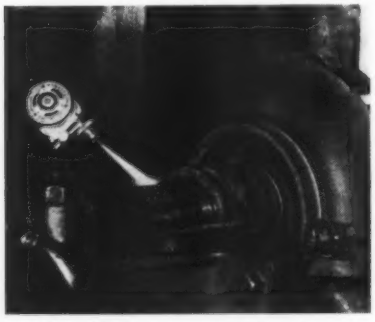
# PUBLIC WORKS
# Equipment News

### Metallizing Can Save Money in Pump Maintenance

Pump parts, such as shafts, hubs, rods, plungers, pistons and sleeves, can be restored by metallizing. Impellers can be built up. Savings are astonishing. Bronze sleeves that



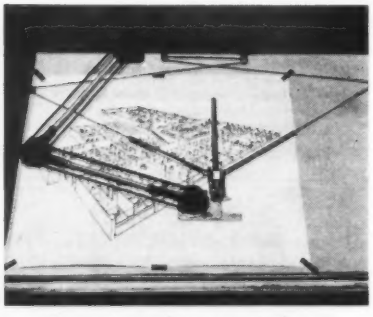
*Metallizing a pump bearing.*

would have cost $44 are metallized for $6.70 each; and the metallized sleeve wears as long as four new bronze sleeves. For more data on these and other cost saving jobs, ask for Vol. 4, No. 5 of Metco News. Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y.

Use coupon on page 85; circle No. 6-1

### It's Simple to Make Perspective Drawings

With this new draftsman's instrument it is simple to make perspective drawings. It automatically guides the draftsman's pencil toward the established vanishing point from any position on the board. These perspectives are a great help in clarifying engineering reports and in making them look fine. We won't go into details on how this instrument works. Get all the data from Bulletin A-1045. Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill.



*Easy to make perspectives.*

Use coupon on page 85; circle No. 6-2

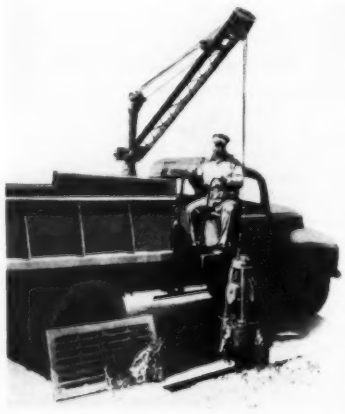
### Stainless Steel Beakers

Stainless steel beakers are now available in the same capacities and dimensions as standard glass beakers. The steel beakers are polished all over and welds are invisible. Other corrosion resistant pieces include measures, dippers, funnels, scoops and buckets. Metalsmiths, Orange Roller Bearing Co., Inc., Orange, N. J.

Use coupon on page 85; circle No. 6-3

### This Crane Does All Kinds of Jobs

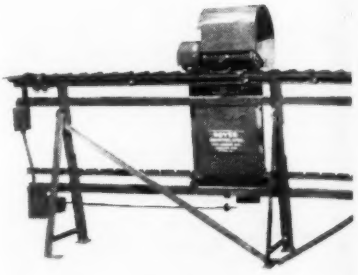
Originally designed for cleaning catch basins, this improved utility crane can be used for: laying water



*Does many jobs at lower cost.*

and sewer pipe, removing and replacing curbstone, installing hydrants, handling valves, stock-piling materials, and setting out or removing trees. With a special clamshell bucket, it is being used for digging on many small jobs where it can do faster and cheaper work than hand labor. Ask for Bulletin M-52, Gar Wood Industries, Inc., Wayne, Mich.

Use coupon on page 85; circle No. 6-4



*Sharpens mower blades quickly.*

### Automatic Sharpener for Mower Sickles

This sharpener will, it is claimed, sharpen a 7-ft. sickle bar in 12 minutes; further, the life of the sickle will be prolonged 100% over hand grinding methods. In using, the sickle is simply clamped on the rack, the grinding wheel is set in position, and the rest is automatic. Saves time and money on mower blades used for cutting street and highway rights-of-way and similar work. Full data from Boyer Industries, 3415 Lakeside Ave., Cleveland 14, Ohio.

Use coupon on page 85; circle No. 6-5

### Hydrotite Now Available in Pigs

Hydrotite is now available in sheets of twelve 2-pound pigs, tied together by their tails so that they may be separated readily. Two sheets

*Twelve pigs, tails tied together.*

are packed in a carton. The pigs are advantageous in that they are ready for dropping into the melting pot as needed, saving handling time. Hydrotite may also be obtained, as

formerly, in 100-lb. bags in powder form. All Hydrotite is protected with a germicide against hazardous soil conditions. Hydraulic Development Corp., 50 Church St., New York.

Use coupon on page 85; circle No. 6-6

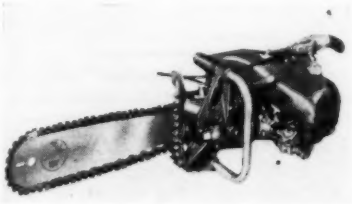
### Trichlorophenoxy Acetic Acid

This is the new brush control compound, good against poison ivy, poison oak, sumac and nearly 60 other types of woody plants. It can be used to reclaim land, along rights-of-way, at airports, and anywhere else that brush and weeds are a nuisance. For full data and information on how to use, write Sherwin-Williams Co., Cleveland 1, Ohio.

Use coupon on page 85; circle No. 6-7

### A Light and Efficient Chain Saw

There are two of these Hornet saws. The one-man model, DJ, weighs 32 pounds and is made with 16" to



*Hornet chain saw.*

36" open end or 24" to 36" tailstock blade. The heavier model, D, weighs 60 pounds and comes with blades from 24" to 72" long. Both machines can cut very close to the ground. The chain can be sharpened in the field with a hand file. These saws are handled by the Southern Distributing Co., Front St. and Central Ave., Cincinnati, Ohio.

Use coupon on page 85; circle No. 6-8

### Front-End Loader for Many Kinds of Work

This material handling loader is mounted on an Allis-Chalmers industrial tractor, which has rubber tires. The bucket is over the driving wheels, which are in front, with the steering wheels in the rear. The Tracto-Loader is only 5'9" wide and 12' long, with the bucket down. Operation and control are hydraulic,

*Hydraulic controlled loader.*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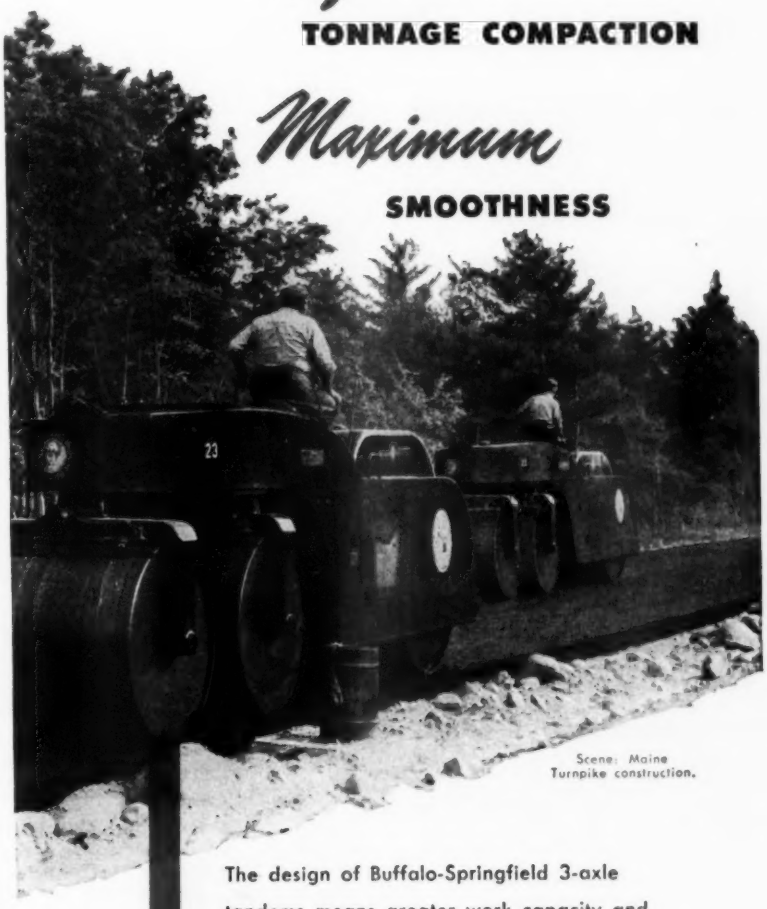

Scene: Maine Turnpike construction.

The design of Buffalo-Springfield 3-axle tandems means greater work capacity and smoother compacted surfaces. Official, unbiased records confirm one 3-axle tandem does the work of two conventional rollers, and the finished surfaces are more than 50% smoother than those compacted by 2-axle machines.

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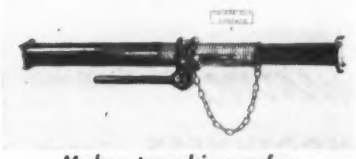
and there are many other features which are described in a booklet available from Tractomotive Corp., Deerfield, Ill.

Use coupon on page 85; circle No. 6-9

### Adjustable Trench Jack Can Save Money

In these days of high labor costs, an adjustable steel trench jack for lateral strutting of trench excavations can reduce trenching costs. This jack is made in three sizes and



*Makes trenching safer.*

is adjustable so as to cover the range from 1'6" to 5'6". Positive and safe fixture is provided. Also available is an adjustable steel shore for supporting framework or spans from 5'7" to 15'. Full data from Acrow, Inc., 420 Lexington Ave., New York 17, N. Y.

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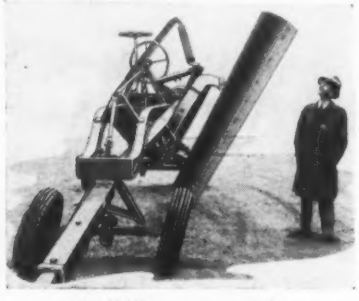
### A Light High-Lift Grader

This new light-weight grader features longer and higher blade reach,



*Gledhill's new grader.*

as well as simplified leaning wheel construction. Among other features are pneumatic tires, self-locking raising and lowering device and automotive type steering gear; all gears are in oil-tight cases; roller bearings are used elsewhere. Gledhill Road Machinery Co., Galion, Ohio.

Use coupon on page 85; circle No. 6-11

### Hand-Operated Gravity Paint Striper

This controlled-flow paint striper has no brush and no engine. It works with any striping or zone paint. The spreader is offset so as to give the operator full view of the line being made. There are two sizes, 9-gal. and 5-gal. capacity. Can be used on concrete, bituminous, wood, mac-

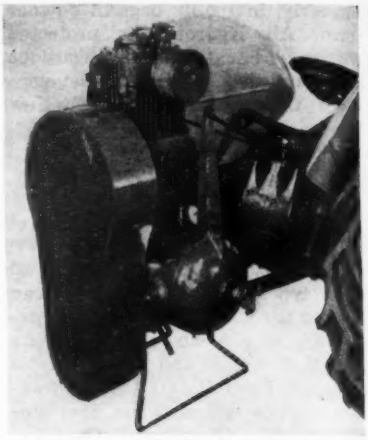
*Controlled-flow traffic striper.*

adam or any other reasonably smooth surface. Universal Marine & Mfg. Corp., 137 Alexander St., Yonkers 2, N. Y.

Use coupon on page 85; circle No. 6-12

### Tractor-Attached Air Compressor

This light-weight and handy tractor-attached air compressor is easily attached or removed. Two models are available, with 17 and 30 cfm capacity respectfully. These units are designed for Ford and Ferguson trac-



*Tractor-attached air compressor.*

tors and hydraulically equipped Jeeps. They are useful for spraying, tamping and vibrating concrete, runnine air tools, etc. Miller-Robinson Co., 7007 Avalon Blvd., Los Angeles 3, Calif.

Use coupon on page 85; circle No. 6-13

### New Federal Motor Truck

A new motor truck, ¾ to 2-ton, has been announced by Federal. Gross vehicle weight is 12,000 to 14,500 pounds, and wheelbases available range from 135 to 194 ins. Engine develops 93 hp at 3400 rpm. For fuller information on this new motor truck write Federal Motor Truck Co., Detroit, Mich.

Use coupon on page 85; circle No. 6-14

### Electronic Air Filter

This is a dry-type electronic air filter of simplified design and intermediate efficiency in dust removal. It does not have an ionizing unit, but when used with electrostatically charged Airmat paper, there is a substantial increase in efficiency—about 60%. This filter is designed for applications where superclean air is not necessary. Bulletin 257 describes it. *American Air Filter Co., Inc., Louisville 8, Kentucky.*

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*Corrugated Pipe Data.*—A 4-page bulletin gives engineering data and cites the advantages of flexible paved corrugated metal pipe. Gauges, areas and weights are recommended. United Steel Fabricators, Inc., Wooster, Ohio.

*Gate Valve Operation.*—The "truck mounted operator", the "gatender" and the "powerench" are described in a 12-page booklet that will be of interest to all water works men. Payne Dean & Co., Madison, Conn.

*Rock Salt Storage.*—A pamphlet suggests means and methods of storing rock salt for winter uses. Designed to help street and highway commissioners and city engineers. International Salt Co., Inc., Scranton, Pa.

*Food Waste Disposer.*—The "Insinkerator" is described in this 4-page folder, which tells how to use with sewers or septic tank, describes the reversing action which gives two-directional shredding, and shows typical installations. InSink-Erator Mfg. Co., Racine, Wisc.

*Sludge Heating.*—"The Spiral Heat Exchanger" is a leaflet by Dorr Co., Inc., 570 Lexington Ave., New York 22, N. Y., which gives data on a new method of sludge heating, with operating data.

*Concrete for Airports*—An excellent and highly attractive 16-page booklet that will give you some new ideas. Portland Cement Association, Chicago, Illinois.

*Scientific Equipment.*—The house organ of Eberbach & Son Co., Ann Arbor, Mich., contains articles and data on laboratory equipment and procedures. We are informed that our readers can have this new issue of "The Announcer" on request.

*Road Construction Machinery.*—Separate folders are available on the following: Trench roller with power operated leveling wheel; road widener for adding 2-ft. to 4-ft. widths to a road, two models, No. 60 and No. 80; base paver which reduces hand labor to a minimum and spreads to 150 tons per hour; and spreader which handles 0 to 100 pounds of material per sq. yd., and spreads 2' to 10' wide. Write All-Purpose Spreader Co., Elyria, Ohio.

*Pipe Jointing Material.*—Flexo-pac rubber yarning material for cast iron water pipe is described in a 4-page folder, and methods of installation are given. Rice-Chadwick Rubber Co., Killbuck, Ohio.

*Demineralizers.*—A 26-page booklet on the production of low-cost chemical equipment of distilled water. American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.

*Tail Gate Cinder Spreader.*—This self-feeding, tail-gate spreader for ice control and roadwork is described in an excellent 4-page booklet. Flink Co., Streator, Ill.

*Tables of Water Equivalents.*—A handy quick reference chart for converting water measurements from one set of terms to another is available from R. W. Sparling, Box 3277 Terminal Annex, Los Angeles 54, Calif.

*Shoveloader.*—A 4-page publication shows some of the many uses to which this shovel-type loader can be put. It also gives specifications. Lull Mfg. Co., 3612 East 44th St., Minneapolis 6, Minn.

*pH and Conductivity.*—A 44-page booklet on pH and conductivity for chemical processes, water treatment, industrial wastes, etc. Brown Instrument Co., Wayne & Roberts Ave., Philadelphia 44, Pa.

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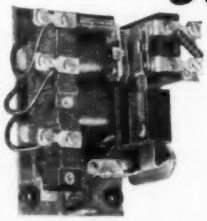

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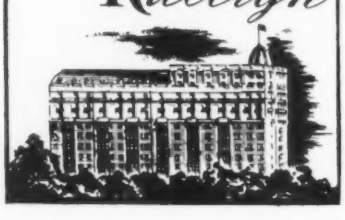

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**42.** Booklet No. P.W. 1742 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, illustration pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

### How to Make Sewage Plant Grit Suitable for Fill, Roadways

**138.** The Jeffrey "Jigrit" washer does a thorough job of scrubbing grit free of organic solids. Grit is classified according to size and organics rejected with overflow. 44-page Catalog 775A describes the "Jigrit" and gives engineering data and installation views of grit and sludge collectors, chemical feeders, garbage grinders and other equipment as well. Dept. PW, Jeffrey Mfg. Co., 948 N. Fourth St., Columbus 16, Ohio.


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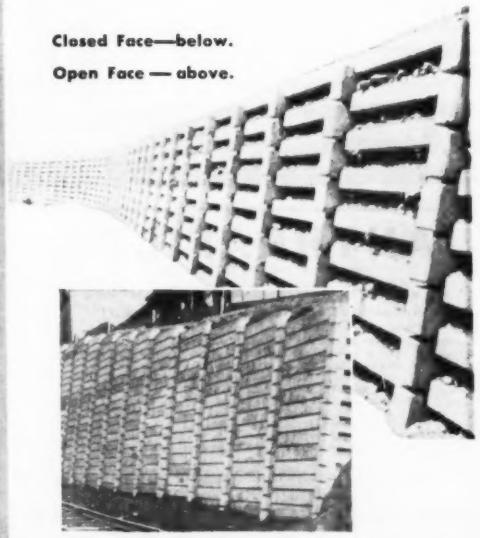

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**49.** The new furnace data bulletin issued by Nye gives information on six furnace sizes which may be used in single or multiple units, plus details of special features. Use coupon or write Nye Odorless Incinerator Co., 51 East 42nd St., New York 17, N. Y.

### Standard Forms for Concrete Pipe

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### An Incinerator Necessity

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## STREETS AND HIGHWAYS

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**22.** BG Maintainer, a powerful speedy, low-priced machine for light road maintenance. Full details in illustrated folder. Huber Mfg. Co., Dept. PW., Marion, Ohio.

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action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

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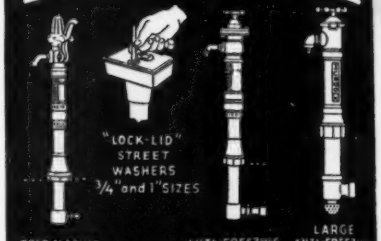
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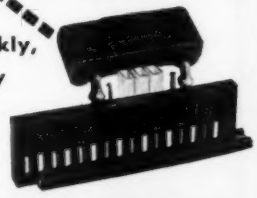

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